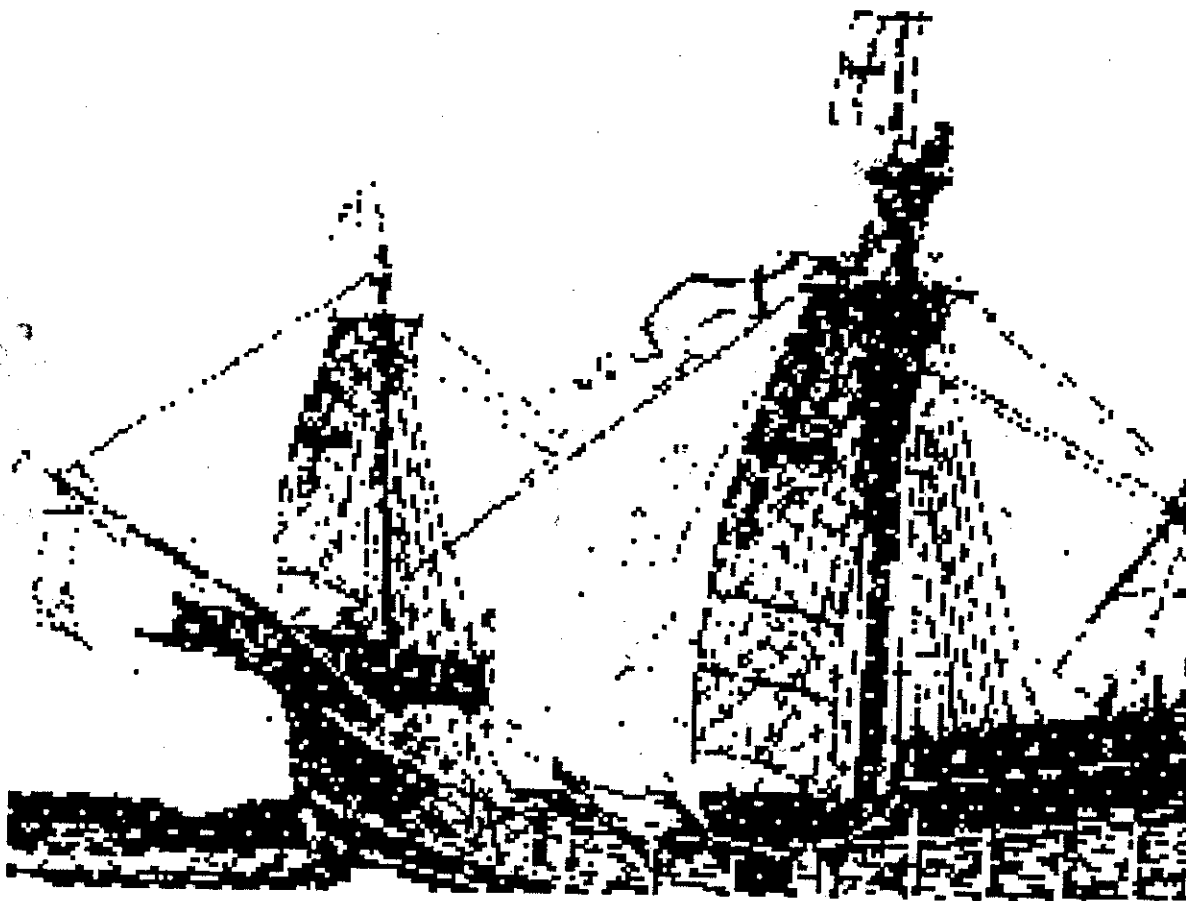


**ALTERNATIVES STUDY
AND
ENVIRONMENTAL ASSESSMENT**

**COLUMBUS LANDING SITE
ST. CROIX, U.S. VIRGIN ISLANDS**



**PREPARED FOR
THE GOVERNMENT OF THE U.S. VIRGIN ISLANDS
BY
DIVISION OF PLANNING, DESIGN, AND COMPLIANCE
SOUTHEAST REGION
NATIONAL PARK SERVICE
JUNE 1990**

The purpose of this document is to provide preliminary planning information for further consideration and discussion. The ideas presented have been neither approved nor disapproved.



EXECUTIVE SUMMARY

Salt River Bay on the north shore of St. Croix, U.S. Virgin Islands, is an important place in America's history. It is the only known site where Christopher Columbus landed on what now is U.S. soil during his discovery of the New World.

This study details options for protecting this historic site under public ownership. Although part of the site has been designated as both a National Historic Landmark and a National Natural Landmark, planned development in the area threatens the site's historic integrity. The alternatives developed for a public park at Salt River Bay are merely concepts. Any actions taken to preserve the site require the approval of the Virgin Islands government, the Congress, and the President.

The study alternatives include:

ALTERNATIVE A : COLUMBUS LANDING SITE PARK

- * 20 acres of land with high cultural values
- * \$2.25 Million for land acquisition
- * \$3.3 Million for development of visitor facilities
- * \$303,000 for staffing (about 12 jobs)

ALTERNATIVE B : COLUMBUS LANDING SITE AND CAPE OF THE ARROWS PARK

- * 145 acres (110 land + 35 water) many cultural and some natural and recreational values
- * \$13.0 Million for land acquisition
- * \$11.0 Million for development of visitor facilities
- * \$474,000 for staffing (about 18 jobs)

ALTERNATIVE C : COMPREHENSIVE SALT RIVER PARK

- * 1000 acres (393 land + 607 water) full ecosystem encompassing A and B
- * \$23.5 Million for land acquisition
- * \$11.1 Million for development of visitor facilities
- * \$474,000 for staffing (about 18 jobs)

ALTERNATIVE D : NO ACTION

The study also outlines options for acquiring and managing the site:

- * The Virgin Islands government would operate and manage the site, after acquisition and development by the U. S. Government.
- * The National Park Service would acquire, develop, and manage the site as a unit of the National Park System.
- * A multi-Agency management group would address various individual agency interests in the greater Salt River Area.
- * A private foundation supported by donated funds would manage the area through cooperative agreements.

Public comments and suggestions on the Salt River Bay alternatives are welcomed. Letters should be sent to :

National Park Service
Division of Planning, Design, and Compliance
75 Spring Street S.W.
Atlanta, Ga 30303

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PART I - ALTERNATIVES

INTRODUCTION AND BACKGROUND

The Salt River Columbus Landing Site is located on the north-central coast of St. Croix, United States Virgin Islands (USVI), approximately 4 miles west of Christiansted. It was here, on his second of four voyages to the New World, that Admiral Christopher Columbus anchored his 17 ships outside the reef and sent his soldiers to investigate an Indian village that was visible on the western side of the bay. This is the only known site where the Spanish landed on what was to become United States territory.

In anticipation of America's 1992 and 1993 commemoration of the 500th anniversary of Columbus' discovery and exploration of the New World, attention has focused on protecting Columbus' 1493 landing site in Salt River Bay. The need to preserve the site's significant natural and cultural resources from increasing threats caused the 16th Legislature of the USVI to draft Bill No. 16-0651, which addressed those concerns. The resultant 1986 legislation (Act Number 5229, see Appendix) called for a cooperative venture between the National Park Service (NPS) and United States Virgin Islands (USVI) to plan, develop and operate a Columbus Historic Landing Site Park at Salt River Bay.

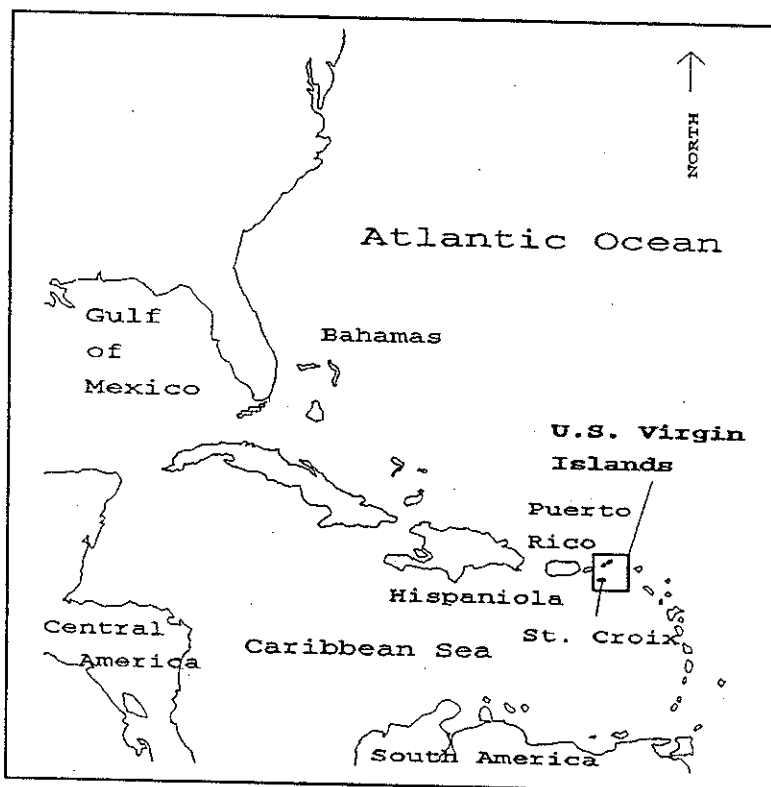


Figure 1 REGION MAP

In response to that legislation, Delegate to Congress Ron de Lugo wrote to the NPS on December 18, 1987, requesting a "new area study for the Salt River Columbus Landing Site." Delegate de Lugo stated, "We need to assess the options for the management of the site, and prepare the site for the Quincentenary celebration, and develop a consensus on its ultimate disposition."

The NPS and USVI Department of Planning and Natural Resources then developed a Memorandum of Agreement to address the various intergovernmental responsibilities (see Appendix). On July 12, 1988, that agreement was signed.

Prior to these actions, Delegate de Lugo was successful in sponsoring legislation extending the duration of the Christopher Columbus Quincentennial Commission by 1 year--to 1993--to cover the anniversary of the second voyage of Columbus and his explorations on St. Croix and Puerto Rico.

A purpose of this study is to apply established NPS criteria for suitability and feasibility as well as analyze alternatives for management.

The ideas presented herein are preliminary concepts that will be refined through the NPS planning process if Congress authorizes a new unit encompassing all or part of the study area.

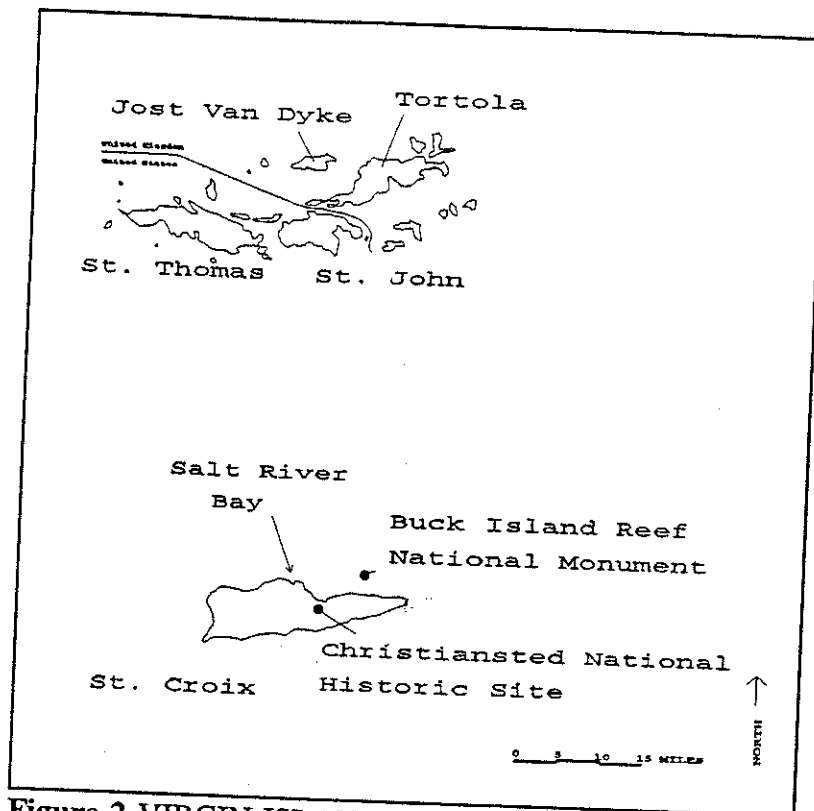


Figure 2 VIRGIN ISLANDS

Studies by the NPS provide the basis upon which the Director, NPS; the Secretary of the Interior; the Office of Management and Budget; involved members of Congress; the Interior Committees; and others may formulate recommendations and arrive at decisions concerning the relative desirability, practicality and priority of a legislative proposal.

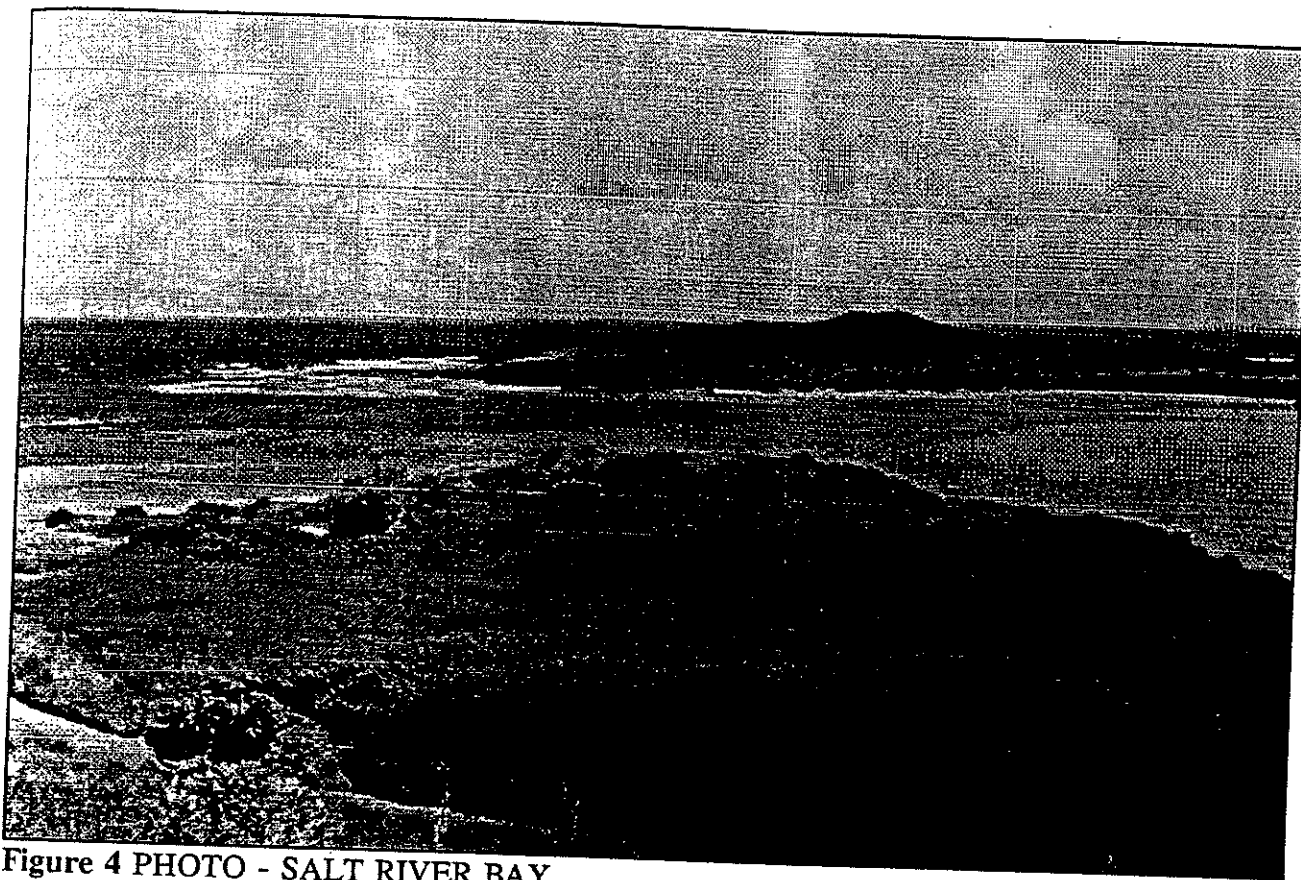


Figure 4 PHOTO - SALT RIVER BAY

THE RESOURCES

The Salt River Bay long has been recognized as an area with important cultural resources. It contains cultural evidence of prehistoric inhabitation encompassing all major cultural periods in the USVI as well as the only ceremonial ball court ever discovered in the Lesser Antilles. The site also is a focal point of various European attempts to colonize the area in the seventeenth century. Danish and American historians and archeologists began cooperating for the study of pre-Columbian habitations when St. Croix passed into the United States' possession. Excavations of village middens, ball court features, and burials have provided evidence for the interpretation of Caribbean life prior to European settlement. Such sites have unique significance because European exploration almost immediately eliminated ancient lifeways.

In addition to the cultural resources, the Salt River Bay area includes prime examples of several types of ecosystems, including mangrove fringe forest, mangrove basin forest, salt pond, and freshwater marsh. Salt River Bay offers a unique combination of public interest

factors, including flora and fauna rarely observed in other of the USVI. The area has a high potential for recreational and educational activities as well as scientific research.

The greater Salt River Bay together with its shoreline (690 acres) was designated by the Department of the Interior as a National Natural Landmark in February 1980, and 5 acres were designated as a National Historic Landmark in October 1960.

The 690-acre National Natural Landmark contains Salt River Bay, including Sugar Bay and Triton Bay. Together the bays encompass a variety of tropical marine and terrestrial ecosystems. The area contains a most significant, high energy tropical reef system and a biologically rich submarine canyon that has become a principal scientific study site for the National Undersea Research Program supported by the National Oceanic and Atmospheric Administration. The terrestrial environment within the natural landmark contains the largest remaining mangrove forest in the USVI. It supports significant and unique flora and fauna. Of special interest is the importance of the area for breeding White-crowned Pigeons and an impressive variety of wintering North American song birds. A portion of the area was identified by the U.S. Fish and Wildlife Service (FWS) in the "United States Virgin Islands Concept Plan," and has been nominated for acquisition as a Nationally Significant Wildlife Habitat.

Tracts within the landmark are owned by the USVI Government and private interests. Five acres were purchased by the USVI Government from the 50 acres authorized in 1958.

CURRENT USES

One commercial operation and one research station occur along the Salt River Bay shoreline. Salt River Marina is a commercial operation that is located along the western shoreline at the mouth of Sugar Bay. This marina includes space for approximately 20 boats, a store and office, a small restaurant, and a boat-servicing facility. Triton Bay contains docks, housing and laboratory facilities for the National Oceanic and Atmospheric Administration's (NOAA) Undersea Research Center, as well as a large private house and outbuildings. In addition, the eastern shore contains the remains of an uncompleted hotel dating to the late 1960's. A good portion of the area was dredged and filled, thereby modifying a portion of the eastern shoreline. The remainder of the Salt River shoreline is relatively natural and undisturbed.

POTENTIAL USES/THREATS

The potential impacts from any of several proposed uses (hotel, convention center, condominiums, marinas, desalination plants, sewage and power systems) seriously threaten the cultural and ecological integrity of the area. A 1988 National Natural Landmarks report sent to Congress indicated the extent of threats to the integrity of the National Natural Landmark. Many threats identified in that report also could impact historic resources in the area proposed for study. Those threats include:

(1) proposed commercial development; (2) proposed dredging and channelization; and (3) possible increase of unrestricted visitor use. Potential resource impacts from such development include: (1) destruction of the mangrove ecosystem by human activity; (2) alteration of coastal processes and degradation of water quality; (3) removal and alteration of native species composition; (4) loss of habitat; (5) degradation of historic sites; (6) loss of archeological data; and (7) loss of the historic scene/setting.

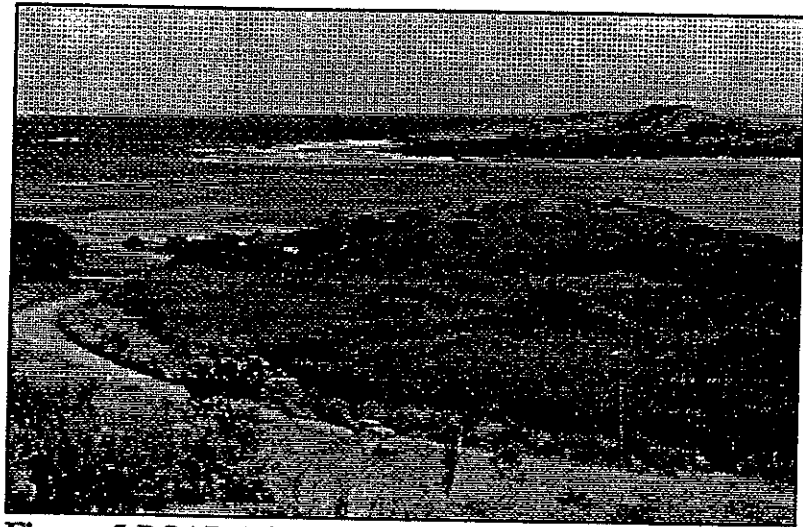


Figure 5 ROAD TO COLUMBUS LANDING SITE

The "Preliminary Planning Cultural Resource Reconnaissance" report of March 1989, issued by the Southeast Region, NPS, stated, "The Salt River Bay is in danger of losing its environmental, archeological, historical, and architectural integrity to a degree that all will be irreversibly damaged by the cumulative effects of ongoing and proposed commercial and private development."

A CHRONOLOGY - SALT RIVER AREA

Outlined below are significant events related to the peoples of the Salt River area.

2000 B.C. and earlier	To date there is no evidence of people in the Virgin Islands to this time.
2000 B.C. - A.D. 100	A preceramic occupation termed the Archaic, distinguished by lithic tools and a subsistence strategy focused on hunting, fishing and gathering.
A.D. 100 - A.D. 600	Rapid transition with evidence of fine ceramics. Subsistence stability afforded by agriculture. Indian peoples have been called "IGNERI" or "pre-TAINOS".
A.D. 600 - A.D. 1200	Agriculture is the stable occupation, however, material culture appears to become somewhat less precise with the introduction of more crude and coarse ceramics. Agriculture continues to be augmented by fishing and shellfish collecting. Indian peoples referred to as Tainos.
A.D. 1200 - A.D. 1493	Tainos who were resident on the island were overrun by hostile Carib Indians.
October-December 1492	Columbus sees land October 12, explores along coast of Cuba, San Salvador, and Haiti, establishes colony of Navidad on northern coast of Haiti. Learns of the hostile Caribs from Indians he encounters.
September 25, 1493	Columbus' second voyage leaves Cadiz, Spain with 17 ships and 1200 sailors, soldiers and colonists.
November 3	Fleet reaches landfall at Dominica in Lower Antilles.
November 14	Fleet anchors off Salt River Bay and Columbus sends boat ashore to explore village and search for water. Soldiers find abandoned Carib Village. While returning to fleet, Spanish sight, attack, and capture seven Indians in a canoe.

November 15	Columbus' fleet continues northward along and through the Virgin Islands.
November 26/28	Destruction of Navidad colony confirmed. One of the two Spaniards wounded in conflict at Salt River Bay dies and is buried on northwest coast of Hispaniola.
1509-1520(c)	Warfare, raids, and disease reduce population of St. Croix.
1587	John White newly appointed governor of colony on Roanoke Island in the Carolinas stops on St. Croix for 3 days. He reports island as virtually deserted.
1631-1636	Settlement of St. Croix by French and English attempted, but each effort results in Spanish action to remove and drive off intruders.
1641	English establish colony in Salt River Bay area.
1643(c)	Dutch who had joined English seize control of colony and erect triangular fort, Fort Sale, on west side of Salt River Bay.
1645	English revolt, kill Dutch governor, drive out the Dutch settlers, and occupy fort with its 11 pieces of ordnance.
1645-50	English population on St. Croix reaches about 600 including settlement on both sides of Salt River Bay.
1647	English settlement on St. Croix attacked by Spain.
1650	Spanish drive out the English and in turn are driven out by the French.
1650-1695	French occupy St. Croix and locate headquarters on east side of Salt River Bay for much of this period. Golden years of settlement are 1660-1676(c) followed by decline which leads to abandonment by French in 1695.
1733	Danish West Indian and Guinea Company purchases St. Croix from France.
1917	Denmark transfers Virgin Islands to United States.

ARCHEOLOGY

The Salt River Bay long has been recognized as an important archeological area. Danish and American historians and archeologists have uncovered evidence of pre-Columbian village middens, ball court and burial grounds. These sites are uniquely significant for interpretation of Caribbean life prior to European settlement.

St. Croix has experienced a considerable amount of cultural resource investigation since the turn of the century. More than 100 archeological sites are recorded in the Office of Archeological Services in Frederiksted. This work has included surveys by professionals as well as amateurs. Often these projects were completed with differing research perspectives and goals as well as varying degrees of understanding. Consequently, the prehistoric cultural history of the island is somewhat sketchy, as much of the archeological data, material, and literature suffers from a lack of continuity and integration that severely restricts its use. Some large museum collections exist, but most were gathered through substandard procedures and lack the necessary contextual information to be much more than representations of Cruzan material culture.

At Salt River Bay almost all of the studies have been directed to the Columbus Landing Site, which has been investigated in some fashion since 1880. These investigations have produced evidence of continuous prehistoric occupation of the site encompassing at least 1500 years.

Archeologist Gary S. Vescelius noted that the pottery he examined appeared to be consistent with types and styles of ceramic developments in the Puerto Rican cultural area of which St. Croix is a peripheral unit. He concluded that a "Carib" occupation was not recognizable from the data in hand. Thus, many questions remain to be answered about aboriginal culture on St. Croix and it may be inaccurate to assign linguistic names to cultural deposits.

The extensive aboriginal occupation of Salt River Bay is represented by shell refuse middens, a ceremonial ball court and scattered surface deposits. These deposits cover a considerable area and extend onto a low marl hill upon which the Dutch completed an earthwork fortification during their brief period of occupation.

As a part of this study, the Interagency Archeological Services Division (IASD) of the Southeast Regional Office, NPS, was asked to acquire information covering the range and distribution of cultural resources (terrestrial and underwater) in the area. The "Preliminary Planning Cultural Resource Reconnaissance" report of March 1989, issued by IASD, details the results of the surveys at the Columbus Landing Site, Sugar Bay, Triton Bay and Cape of the Arrows. Significant findings are as follows:

1. Columbus Landing Site - The subsurface limits of the prehistoric site are almost identical to its surface expression and the site is some 4 acres larger than previously thought.
2. Sugar Bay - A previously unidentified multi-component site was discovered.
3. Triton Bay - Testing revealed a number of small broken fragments of ceramics, but failed to locate additional classes of material.
4. Cape of the Arrows - This study unit provided the greatest challenge, as much of the area has been modified extensively by construction activities, dredging, and road building. A significant prehistoric burial ground was found by Archeologist A.E. Figueredo (1986) during his cultural resource assessment of property in Estate Judith's Fancy. The burial ground, somewhat distant from major construction activities, is relatively intact and offers researchers a unique opportunity for further study, especially with the possibility of finding an associated aboriginal habitation site in densely vegetated areas nearby. Bone fragments recovered from the burial site at Judith's Fancy were submitted for radiocarbon dating. The resulting radiocarbon data suggest an interment date of 1150 B.P. (before present) \pm 70. The calibration tables place the real time scale period of the sample between A.D. 665 and A.D. 1015. These data suggest that the burial area was in use as much as 800 years before the arrival of Columbus.
5. Underwater survey - The survey team located a single cannon (4-feet 3-inches long) along the edge of White Horse Reef outside Salt River Bay. Within the bay were found cast-iron ship fittings, a cast-iron grate resembling those used in processing sugar and molasses, clusters of bricks, a length of iron chain (2-inch links) and other miscellaneous artifacts, including several historic ballast piles.

Parts of three additional cannons were found washed from the embankment below Grieg's Fort after the devastation of Hurricane Hugo in mid-September 1989.

A BRIEF HISTORY

On October 12, 1492, Christopher Columbus sighted land on his first voyage after 2 months and 9 days at sea. He believed he had reached the Indies; but instead had found a new world, at least from a European perspective. The voyage lasted 5 more months as his three ships sailed from San Salvador, where he first landed in the Bahamas, along the west coast of Cuba, and to Hispaniola. Here he lost the ship Santa Maria. Using the timbers from the wreck, he established, with many willing volunteers, a colony named Navidad. On January 4, 1493, the ships Nina and Pinta under his command turned toward home.

Upon his arrival in Spain on March 14, he and his crewmen were honored with a series of celebrations, greeted with accolades, and honored by King Ferdinand and Queen Isabella. Columbus had brought back six native Americans whom he termed "Indians," parrots, samples of spices and evidence of gold, all of which were most impressive to his sovereign lords. Within a month after his arrival, he had agreed to lead a second expedition whose goal was to convert the native Americans and to establish another colony. In contrast to the first voyage, he was besieged by volunteers wanting to go with him. Columbus commanded a fleet of 17 vessels, including Nina. On September 25, they sailed from Cadiz, and 1 year to the day after he had sighted land in 1492, the fleet departed from the Canary Islands. Among the 1,200 soldiers, sailors, and colonists were six priests and five of the six Indians who had returned with him to Spain after the first voyage.

Sailing with the trade winds, the fleet reached land on November 3, 1493, striking the island of Dominica, one of the Leeward Islands. From November 4 through November 10, the fleet anchored off Guadalupe. Eager to reach Navidad, Columbus sailed west and then northwest until, on the morning of November 14, they approached the island which the native Americans called "Ayay" in Taino language and "Cibuquiera" in the Carib. Columbus, however, named it Santa Cruz. Sailing westward along its northern shore, the Spanish were impressed by both the evidence of cultivation and the fact that it was well populated. The fleet reached Salt River Bay about 11 o'clock in the morning after passing the future site of Christiansted harbor which, because of its reefs, would have seemed inaccessible to the explorers.

When the fleet anchored, Columbus sent a longboat ("armed pulling boat") with 25 armed men ashore to explore the settlement on the west bank of the bay. Their intent was to capture some natives to provide information on the route ahead, to find fresh water, and to investigate the immediate area. They landed near the village which had a few huts (six in one account), from which the Caribs (also known to the Spanish as "Caribbees") had fled temporarily. Michele de Cuneo, who was with the landing party, reported that they entered the huts and took whatever pleased them. The Spanish also captured or freed from Carib captivity five or six Taino women and some boys who informed the Spanish soldiers that the island was controlled by the Caribs. No one knows how long the party remained ashore, but their stay was at most a few hours. As the landing party prepared to head back to the fleet with its booty and captives, it became aware of a Carib canoe containing four men, two women, and a Taino boy sitting motionless. The occupants of the canoe stared awestruck at the 17 ships anchored beyond the reef.

Specifics on where the canoe had come from, how long it had remained motionless, and the relationship of the fleet to the canoe and the shore party, are clouded by three varying eyewitness accounts. However, when the Spanish saw the canoe, they moved to interpose themselves between the occupants of the canoe and the shore with the intent of capturing them. The Caribs reacted by firing arrows at the approaching Spanish longboat. The

Spaniards rammed and overturned the canoe and captured its occupants. They were taken to the Admiral's flagship, Mariagalante. The Spanish were much impressed with the courage of the Caribs and their "terrible, menacing and cruel aspect."

The Spanish had suffered two wounded--one of whom died several days later. One of the adult Caribs had been wounded several times ("shot up until his intestines hung out"). Believed to be beyond help, he was tossed into the sea, but the warrior began swimming toward shore. The Tainos, fearful that he would bring Caribs to wreak vengeance on them, persuaded the Spanish to recapture him. He then was bound and tossed back into the sea, but escaped his bonds and headed to shore again. He finally was killed by several arrows. The other adults were held captive and, in February 1494, they were sent to Spain with other Indians and evidence of the riches the new land possessed. The boy, a captive of the Caribs, was not mentioned again.

By now, it was late afternoon and the shore was lined with Caribs painted for war, but they had no weapons that could reach the ships. Taking advantage of the excitement, several more of the captive Tainos swam out to the ships to seek refuge. The Admiral, recognizing that further contact was out of the question, ordered the fleet underway. Columbus later designated the prominent east point or cape "Cabo de las Flechas," or Cape of the Arrows in honor of the Basque seaman who died of his wounds on November 23. The name never was entered on any known map and remains a point of dispute among historians.

This incident is the first documented hostile encounter between the Spanish and natives of the New World. However, an earlier, unrecorded encounter had occurred. Two weeks after the skirmish at Salt River Bay, Columbus was to confirm what he already feared--the colony of Navidad on Hispaniola established 11 months earlier had been wiped out by the natives. Apparently, the Spanish colonists' lust for gold and native women resulted in their deaths. A second colony was established, and exploration continued until the end of September 1494.

Columbus finally returned to Spain in June 1496. He would make two more voyages to America in the next 8 years.

The Caribs had migrated up the lesser Antilles displacing the Arawakan speaking people, the Tainos, who had preceded them, on three of the islands: Dominica, Guadeloupe, and St. Croix. They are presumed to have arrived on St. Croix less than 100 years before the Spanish fleet visited the island.

With the departure of the fleet began a period of nearly 150 years with no known European activity on the shores of Salt River Bay. In the first half century, however, there were several decades of conflict between the Spanish and the occupants of the island. The causes of this conflict were the hostile and aggressive nature of the Carib Indians and the Spanish drive to conquer, Christianize, or enslave the natives. In 1503, Queen Isabella ordered that

all natives who were enslaved and Christian should be freed, but those who were hostile could be slaves. Presumably there were slave raids against the Caribs in the years that followed. In 1509, Ponce de Leon executed a peace treaty with the Caribs. A slave raid on St. Croix and the capture of 140 natives a few months later ended the peace almost before it began. The Caribs aligned themselves with the Tainos in Puerto Rico in their battles with the Spanish beginning in 1511. By 1520, the Tainos were destroyed. The Caribs continued to battle the Spanish, but ultimately lost the war. Those not killed migrated away from St. Croix.

The exact date that St. Croix became "despoblado" or without people has not been established. It was well populated and highly cultivated in 1493, but when visited by John White in 1587 it was virtually abandoned. White, dispatched by Sir Walter Raleigh as the new Governor of the colony on Roanoke Island stopped on St. Croix for 3 days. During his stay, various parties moved over the island finding only a cluster of houses and seeing 11 natives.

The scarcity of native inhabitants reported by John White and others in the last decades of the 1500s continued into the first decades of the 1600s. In early 1641, English settlers arrived on the island with most of the colonists coming from St. Christopher. Fourteen months later they were set upon by Dutch settlers who forcibly seized the island. Along with establishing a colony, the Dutch also completed the triangular fort on the west side of Salt River Bay. Most of the English settlers remained under Dutch domination. In 1645, the English revolted, killed the Dutch Governor and drove off all the Dutch settlers who returned to St. Eustatius and St. Martin. They left behind the fort at Salt River Bay with its 11 pieces of ordnance.

Specific details of what occurred in the period from 1641-1645, and in the 5 years that followed are unclear. In 1645, there were approximately 600 people on the island. The English had a relatively brief period to enjoy their triumph. The Spanish in Puerto Rico, ever concerned for intrusion on their claims, decided to remove the English in 1647, but this attempt was not successful. In August of 1650, they tried a second time by dispatching 1,200 men in five ships. Faced with this force and weakened by disease, the English, after losing 26 men in battle, were informed by the Spanish that those who had not departed in 3 weeks would be slaughtered. The English gratefully left the island.

The Dutch, hearing that the English were gone and assuming that the Spanish had returned to Puerto Rico, were determined to reclaim the island. Unfortunately for the Dutch, the Spaniards were still there. The 60 Spanish soldiers in the fort concentrated their guns on the 2 Dutch ships and ambushed the landing party. The Spanish returned to the fort--presumably still containing the 11 guns that the Dutch had mounted in the early years of the decade.

The English had left behind a substantial amount of development. A Spanish reconnaissance or intelligence map of St. Croix prepared in 1647, prior to the first attempt to oust the English, showed the following in the Salt River Bay area: on the west side of the bay was the fort completed by the Dutch, the "House of their preachers," and the Governor's house. Four representations of houses indicating farms line the east side of the bay--there are 27 additional residences shown on the island. A system of roads is shown, together with fortifications in the general area of the future sites of Christiansted and Frederiksted (Fort St. James).

The Spanish did not have long to enjoy the fruits of victory, for Phillipe de Poincy, Lieutenant General of the French West Indies, dispatched a gunboat and a barkentine with 160 men from St. Christopher to seize the island. De Vaugalan, who commanded the group, marched on the fort with 120 men and issued an ultimatum: "surrender or be taken by assault with no quarter given." The Spanish surrendered within the 2-hour deadline and were allowed to return to Puerto Rico on a vessel that was given to them. St. Croix which had been held by two other nations in 1650, was occupied by the French for the next 45 years.

In 1651, de Poincy purchased St. Croix, St. Christopher, St. Martin, St. Bartholomew, and Tortuga with income from his two commandaries in the Knights of Malta. Two years later, he transferred these possessions to the Knights of Malta. This was confirmed by the French Crown in March of 1653, with the provision that the islands were to be held in fief for the crown and to be governed by a Frenchman. Despite this change in ownership, the islands continued to decline because of trade restrictions, taxes, sickness and other impositions by the governing authority. A new Governor, du Bois, was appointed in 1659 and quickly galvanized the planters into action. He began to effect changes that resulted in the repopulation of the island. Among the changes was the movement of the main settlement from Bassin to the Salt River Bay area.

Between 1660 and 1663, a residence for the commander or governor was built of stone. Located on the east side of the bay, it was a two-story structure with towers at both ends. Elaborate formal walks were built to the other government buildings. Gardens and parks were constructed. A sugar factory was constructed as well as a stable and other outbuildings. By 1663, there were 822 residents on the island. Across the bay on the west side was the old Dutch fort which du Bois may have enlarged. Here also were the landing stages, possibly a customs house and indigo vats; up the hill in what was known as the "Northside Quarter 10-B" in the early Danish surveys, was the monastery of the Dominicans with adjacent plantation and sugar factory.

It now appeared that the Island of St. Croix was to prove as fruitful and prosperous as de Poincy always had believed. For a few years it was, but in the 1670s decline set in, resulting from disease as well as changes in the ownership of the island and international politics. The French presence dwindled back to the level it was prior to 1659. From 1674

until 1695, St. Croix and its settlers struggled on. A decision was made in 1695 to abandon the island. The remaining 147 whites and 623 slaves were transported to St. Domingo.

The island quickly reverted to nature and in 1700 a visitor noted that only plants such as the pomegranate, lemon, cashew, potato, cassava and fruit trees, remained while cattle roamed the island. In 1733, the Danish West India and Guinea Company purchased St. Croix from France. On St. Croix, the Danes began to settle the island wilderness, as the French, English and Dutch had done before them. Ironically, 240 years after Columbus' arrival, evidence of European occupancy generally was limited to ruins, exotic plants, and animals.

In the vicinity of Salt River Bay, these ruins included the house of Commander or Governor du Bois together with other governmental buildings, a sugar factory, and support buildings located toward the upper end of the bay on the east side. There were at least two other plantations on the east side of the bay--the northernmost being where Judith's Fancy later was located. On the west side were the fortification (Fort Sale) and two plantations and a structure with a cross marked "Iacobins." ("Jacobins" was the term applied to the Dominicans who established a monastery and had resided on the island from 1660 until its abandonment.) There may have been other remains that are not on the map prepared by du Bois in 1671. The evidence of European presence on the land surrounding Salt River Bay from 1493 to 1695, is scant, scattered, or concealed beneath the plantations, great houses, and sugar factories erected by the Danes in the eighteenth and nineteenth centuries.

It is suspected that Danish settlers may have built on or incorporated portions of the structures left by the French or English. Denmark's colony was to flourish for a century and a quarter before declining economically from the introduction of the sugar beet and emancipation of the slaves. However, the Danes adapted to these changes and St. Croix and the other two major islands remained in Danish hands until purchased by the United States in 1917. Interpretation of the Danish period at Salt River Bay will provide a transition into the story being told at Christiansted National Historic Site.

Today, St. Croix's economic base is tourism. Preservation and protection of Salt River Bay and its environs where Columbus visited and European colonies existed will contribute to that end.

PRELIMINARY ETHNOGRAPHIC DESCRIPTION

There are no remaining Native Americans or other identified groups on the island associated with the prehistoric use of the envisioned park area. Archeologist Irving Rouse (1948) stated, "No estimates of the original population of the Carib Islands have been discovered. By 1700, it is said that the number of those Indians had fallen to 4,000, half of them on Dominica (U.K.) and the rest on St. Vincent (U.K.)." The nearest group tracing its heritage to the Caribs remains on the island of Dominica.

There are no present-day subsistence uses or religious ceremonies associated with the prehistoric peoples who inhabited the Salt River Bay.

Crucians, a multiethnic social group, are known for their traditional use of the area for diving, picnicking, crabbing, fishing, sunbathing, windsurfing, swimming and camping. Their needs, wishes and opinions have been identified and considered during the planning process. A widely publicized public meeting provided a forum for the islanders to be heard.

The NPS will continue to plan and execute programs in ways that safeguard the cultural and natural resources of the area while reflecting informed concern for the peoples and cultures traditionally associated with them.

An ethnographic overview and assessment is recommended as a part of any future General Management Plan Study. This paper recognizes that a professionally qualified cultural anthropologist will be needed to eventually provide current and systematic information on all native American and other ethnic groups historically and presently dependent on resources within the various alternatives, including the Taino, Carib, Spanish, Africans, English, Dutch, French, Danes, and Americans as well as potentially affected publics for NEPA-mandated public involvement.

PLANNING PERSPECTIVE

The following discussion provides development options for a Salt River Park. Each option is designed to provide a logical package that can be compared with the others. The alternatives range from a "no action" option, which will be discussed only in the "Environmental Consequences of Alternative Actions," to one that incorporates all of the Salt River Bay and shoreline plus adequate land necessary for area management. Phasing of development activities also is included for the three primary alternatives.

The following three alternatives were chosen with the intention of providing different concepts for preservation and development. The preferred alternative can be a combination of the three or even a completely new one. Concepts for development are preliminary and would be refined through the General Management Plan process, if a park were authorized.

To assist with the original development of the alternatives, and to provide greater insight into the review process, planning goals were developed for each of the three primary alternatives.

Boundary determinations were made through the use of computer plotted maps showing both cultural and natural features of the area. These features were plotted onto transparencies which were superimposed to show their extent and relationship to property lines. Boundaries were adjusted to avoid severance of lands where possible.

After authorization and before land acquisition commences, a Land Protection Plan (LPP) will be formulated which will consider carefully the protection of lands within and adjacent to the boundaries selected for the park.

SUMMARY OF THE FOUR ALTERNATIVES AND PLANNING GOALS

Alternatives A through C are predicated upon a progressive building of concepts as to size and to features to be preserved. Alternative A is the least; Alternative C is the maximum.

Alternative A: COLUMBUS LANDING SITE

Planning Goals: Protect and interpret the Columbus Landing Site, including the Indian village site, the ceremonial ball court, and the European fortifications. Provide facilities for parking, a small onsite visitor contact and information facility, trails and wayside exhibits. Although camping and other forms of 24-hour use are inconsistent with long-range objectives for the protection of the natural and cultural resources in this alternative, a continuation of the present range of beach and water-oriented recreation would be envisioned.

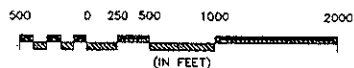
Alternative A encompasses 20 acres of land on the western side of Salt River Bay.

The 5-acre National Historic Landmark, owned by the USVI Government, contains only the heart of the Indian village which extended a considerable distance beyond the 5-acre landmark boundary. Additional land, amounting to 15 acres, is included in this alternative so that known archeological resources are preserved. A parking lot, small information/ranger station, and a roadway to the beach to permit access would be located away from the area's significant archeological resources. In addition, trails to provide access to the historic sites and beach, and pertinent onsite exhibits to provide interpretation at the key sites, must be sited cautiously to avoid damage to the resources.

All of the above features are carried forward into Alternatives B and C.

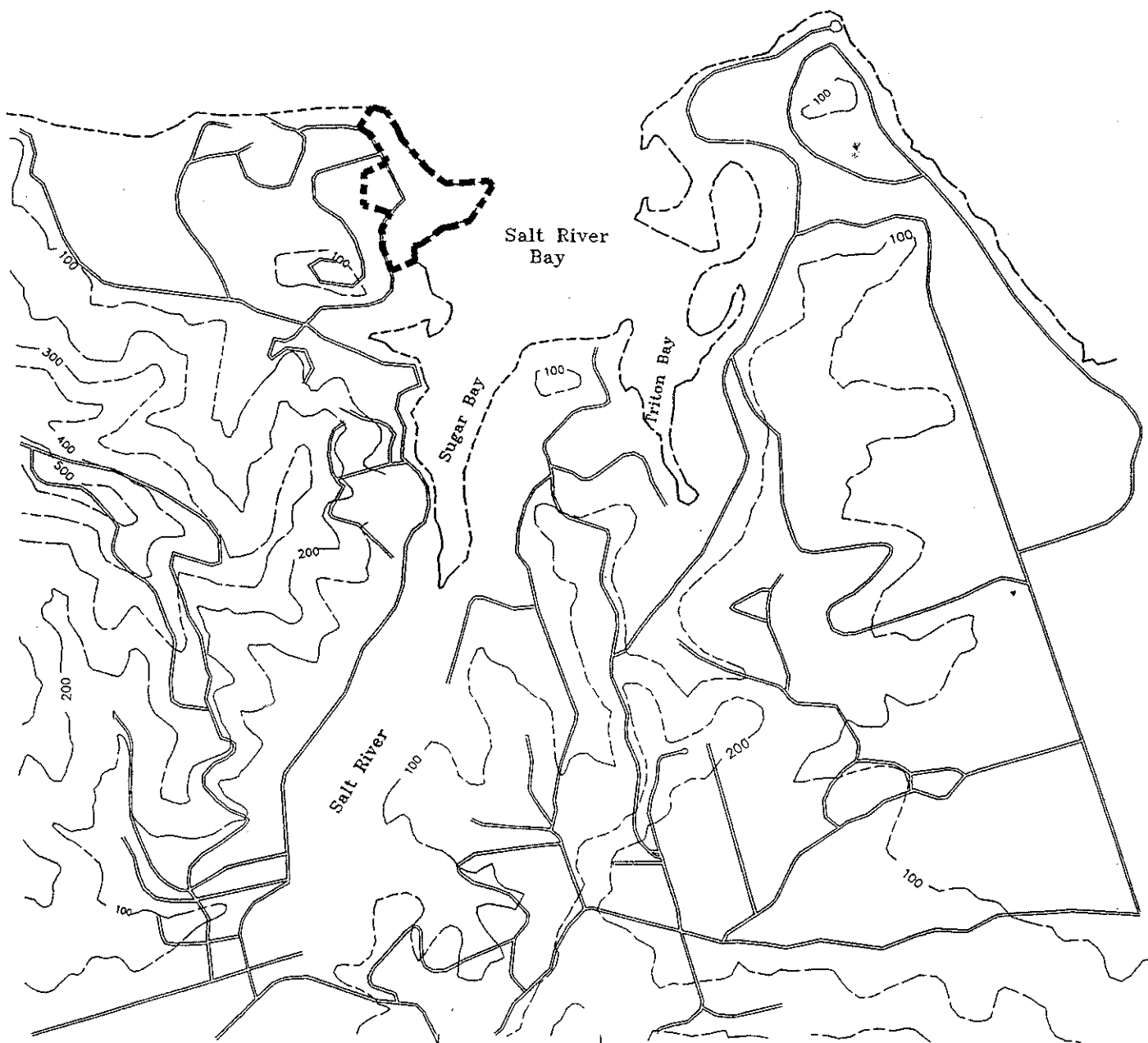
SALT RIVER STUDY AREA

ALTERNATIVE "A"



CONTOUR INTERVAL 100 FEET

■■■■■ BOUNDARY



Alternative B: COLUMBUS LANDING SITE AND CAPE OF THE ARROWS

Planning Goals: Protect and interpret the Columbus Landing Site and Cape of the Arrows, including the Indian village(s) with their ceremonial ball court and burial sites, and European fortifications. Provide facilities for a visitor center and museum, orientation and wayside exhibits, trails, housing, maintenance area, and fencing for security reasons. Limited picnicking and camping in areas removed from the beach together with continued beach and water-oriented recreation are envisioned in this alternative.

Alternative B is a two unit park and encompasses approximately 110 acres of land and 35 acres of water on the west and east sides of the mouth of Salt River Bay. This alternative includes all of the Columbus Landing Site from Alternative A. The western unit requires all of the same facilities that are described in Alternative A. The larger Cape (eastern) section would require entrance and access roads, two small parking lots and one major parking lot, trails, an overlook, wayside exhibits, picnicking sites, and fencing for security reasons. Five additional structures are included:

- (1) Orientation/information station along the entrance road, complete with rest rooms and exhibits. The site could provide a trailhead for a mangrove nature walk.
- (2) A visitor center/museum and park headquarters would most likely be located in the center of the Cape section. The structure will provide museum space for artifacts and materials being collected under the auspices of the Columbus Jubilee Committee. The building also should contain adequate office space and parking for visitors and for a park staff.
- (3) A beach house for changing, together with showers and rest rooms, is proposed adjacent to the beach. A small parking area would be required.
- (4) Housing for park protection personnel will be necessary to assure 24-hour security of the park facilities and also to address the concerns of park neighbors.
- (5) A maintenance building and storage yard would be necessary for the maintenance of the park facilities.

SALT RIVER STUDY AREA

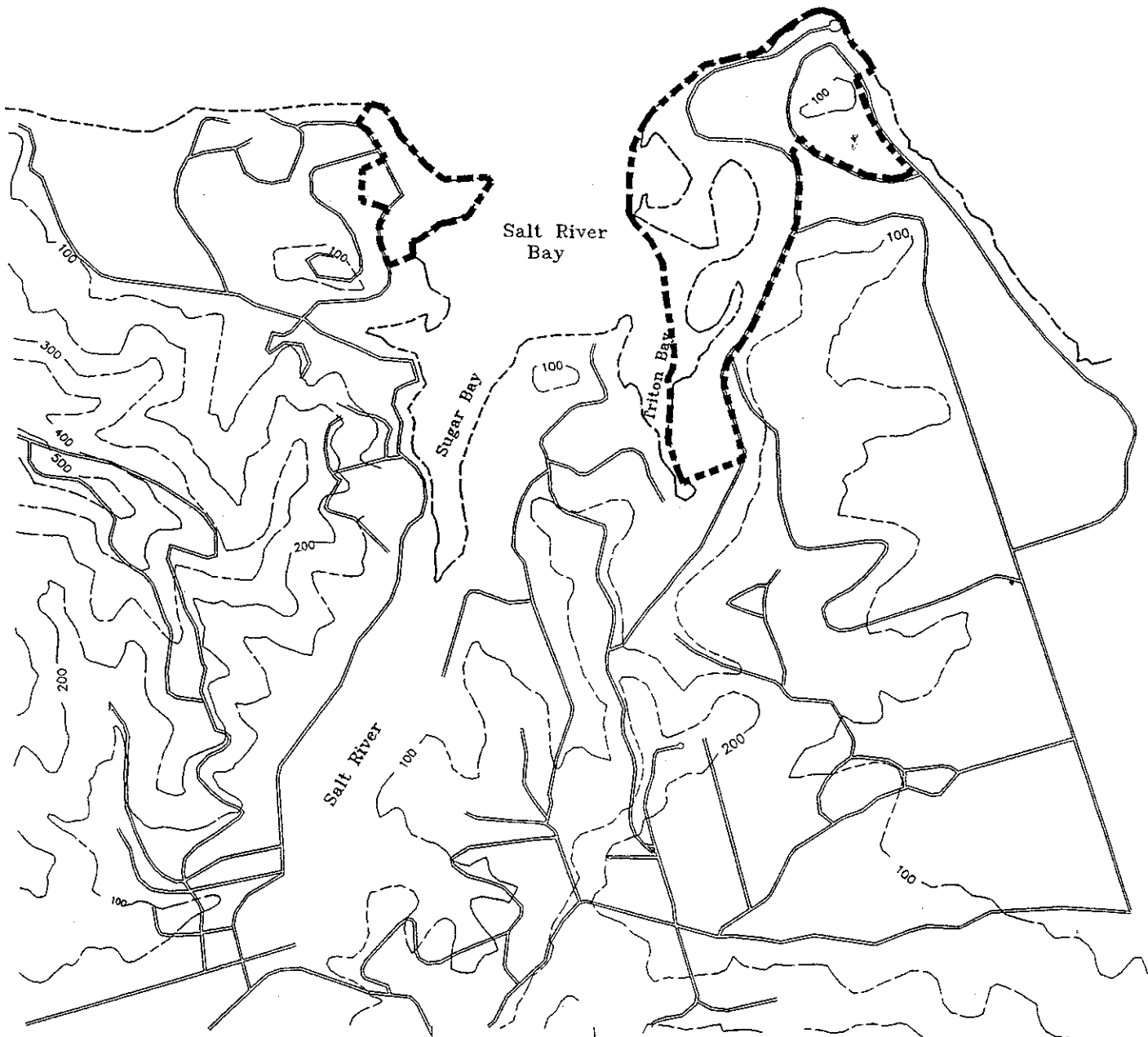
ALTERNATIVE "B"



CONTOUR INTERVAL 100 FEET



■■■■■ BOUNDARY



Alternative C: COMPREHENSIVE SALT RIVER PARK

Planning Goals: Protect and interpret the principal resources, both cultural and natural, and do so within a holistic perspective. The historical and archeological resources include the Columbus Landing Site, Indian village(s), including the ceremonial ball court and burial sites, the European fortifications, and the Danish Customs House. The natural resources include the Sugar Bay ecosystem continuum from freshwater stream to submarine canyon, and additional terrestrial areas that may be necessary to limit threats from adjacent land uses.

Provide facilities for a visitor center and museum, suitable information/orientation stations, observation point, trails and waysides, housing and maintenance area, and fencing for security reasons. Limited picnicking and camping in areas removed from the beach together with continued beach and water-oriented recreation are envisioned in this alternative.

This alternative includes the Columbus Landing Site and Cape of the Arrows sections as described in Alternatives A and B, and also incorporates all of the water surface and marine resources of the Salt River Bay, Triton and Sugar Bays, together with their terrestrial shorelines and land areas between and south of the Triton and Sugar Bay arms. This park includes all of the area within the current National Natural Landmark, and is extended seaward to a 300-foot depth. Alternative C encompasses a total of approximately 1000 acres of land and water (393 land and 607 water).

The comprehensive Salt River Park encompasses all of the significant resources that provide the ecosystem continuum described above. It also includes considerable land surrounding the Salt River shoreline to provide greater protection to the natural system. The boundary of this larger park includes several private holdings, which may or may not be necessary for purchase, depending upon the intentions of the land owners. It is through the formulation of the LPP that strategies would be considered carefully for the protection of lands within and adjacent to the boundaries of the park. Within the boundaries, the LPP will consider a number of different alternatives and strategies that would protect the integrity of the park resources. These could include types of private uses that would be compatible or incompatible with planning goals, scenic easements, agreements, local zoning, technical assistance, educational activities, and historic preservation details. The LPP will determine which technique is most appropriate for the specific case.

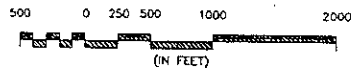
The Nature Conservancy, owner of 10.4 acres of land within Alternatives B and C on Triton Bay, has expressed support for this planning effort.

Easements may become an important method of resource protection in this alternative.

Two additional Federal agencies have expressed support for this planning process because of their interests in preserving portions of the Salt River system. The U.S. Fish and Wildlife Service already has studied Sugar Bay and its floodplain as a possible site for a National Wildlife Refuge. The Marine and Estuarine Management Division of NOAA has expressed interest in establishing a National Estuarine or Marine Sanctuary at Salt River Bay.

SALT RIVER STUDY AREA

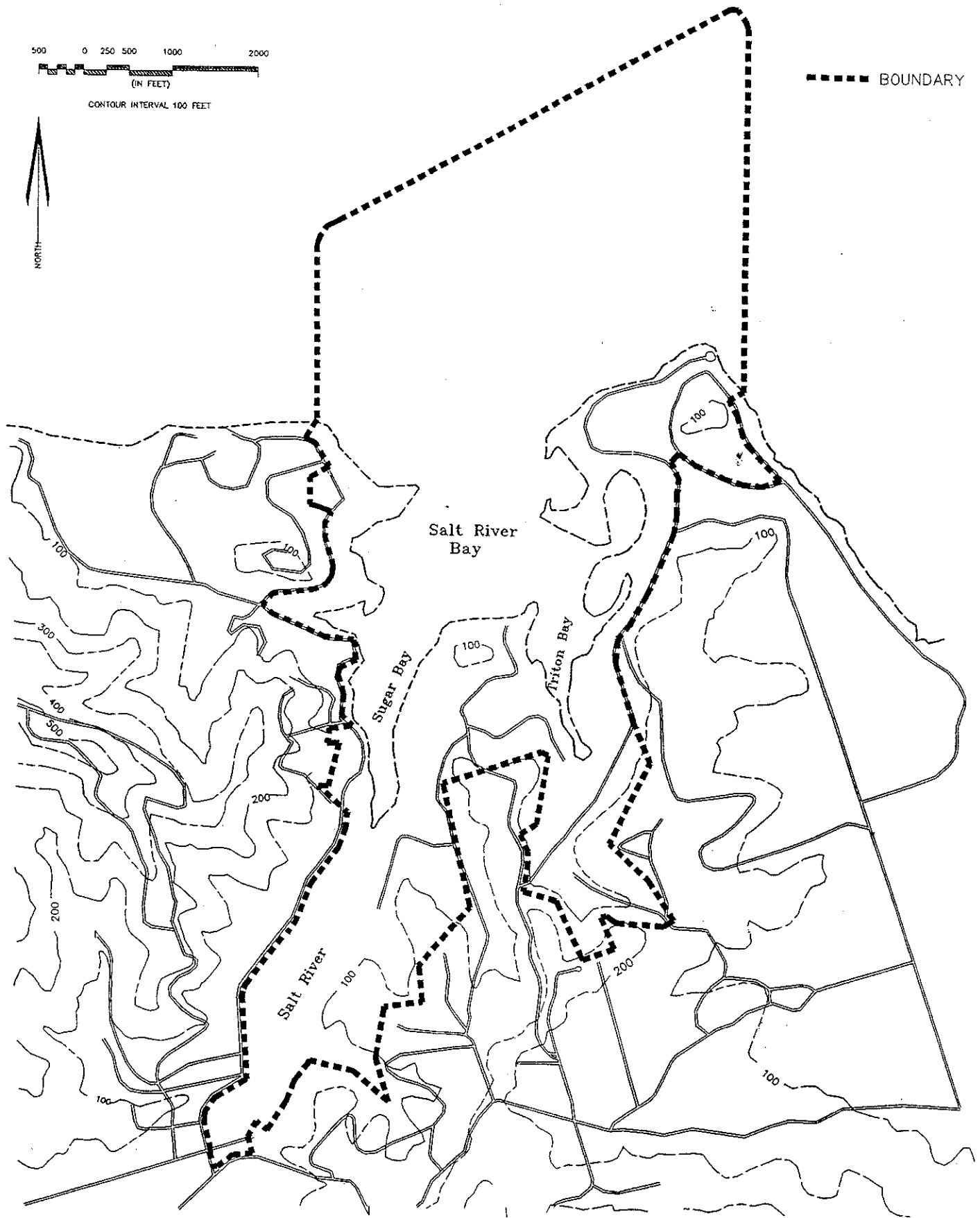
ALTERNATIVE "C"



CONTOUR INTERVAL 100 FEET



----- BOUNDARY



DESCRIPTION OF ALTERNATIVES

Alternative A: COLUMBUS LANDING SITE PARK

Overview: Alternative A focuses on the site of the Columbus landing and the Indian village. The importance of the Indian village, and the consequent history at this site, represent a historical perspective that cannot be equaled. Archeologists have recently identified the outer limits of the Indian village, and it is this area that should be considered most important. In a sense, the 1493 Indian village site controls park planning efforts because it extends beyond the boundary of the present 5-acre National Historic Landmark.

An important feature of the village is the site of the ceremonial ball court located within the present landmark area. At the promontory at the mouth of Salt River Bay are the remains of two forts--Dutch/English/French and Danish--that were constructed long after the native people departed.

In order to protect the area's keystone resources, visitor facilities should be located outside the historic villages in such a manner that access to the historic sites and the beach does not impact upon the significant resources to be protected. Facilities should include an access road, a visitor information/ ranger station, and parking.

The boundary of this park should extend beyond the 5 acres currently under the ownership of the Virgin Islands Government. The boundary of a viable park should include approximately 20 acres, increasing the size of the existing public property by about 15 acres.

Historical Resources. Keystone resources include the Indian village site with its important ceremonial ball court, and the remains of two European fortifications. It is possible that a portion of the ball court has been impacted by excavations and road building; however, there are significant, identifiable remains of Fort Sale and the Danish fort.

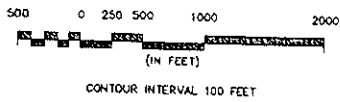
Natural Resources. The beach and adjacent waters provide a minimal natural resource area.

Fringe mangroves occur along the Salt River Bay shoreline. This environment provides important soil stabilization and habitat for various wildlife species.

Park Themes. Alternative A provides only for a historic park and the continuation of the common beach uses. Park themes include:

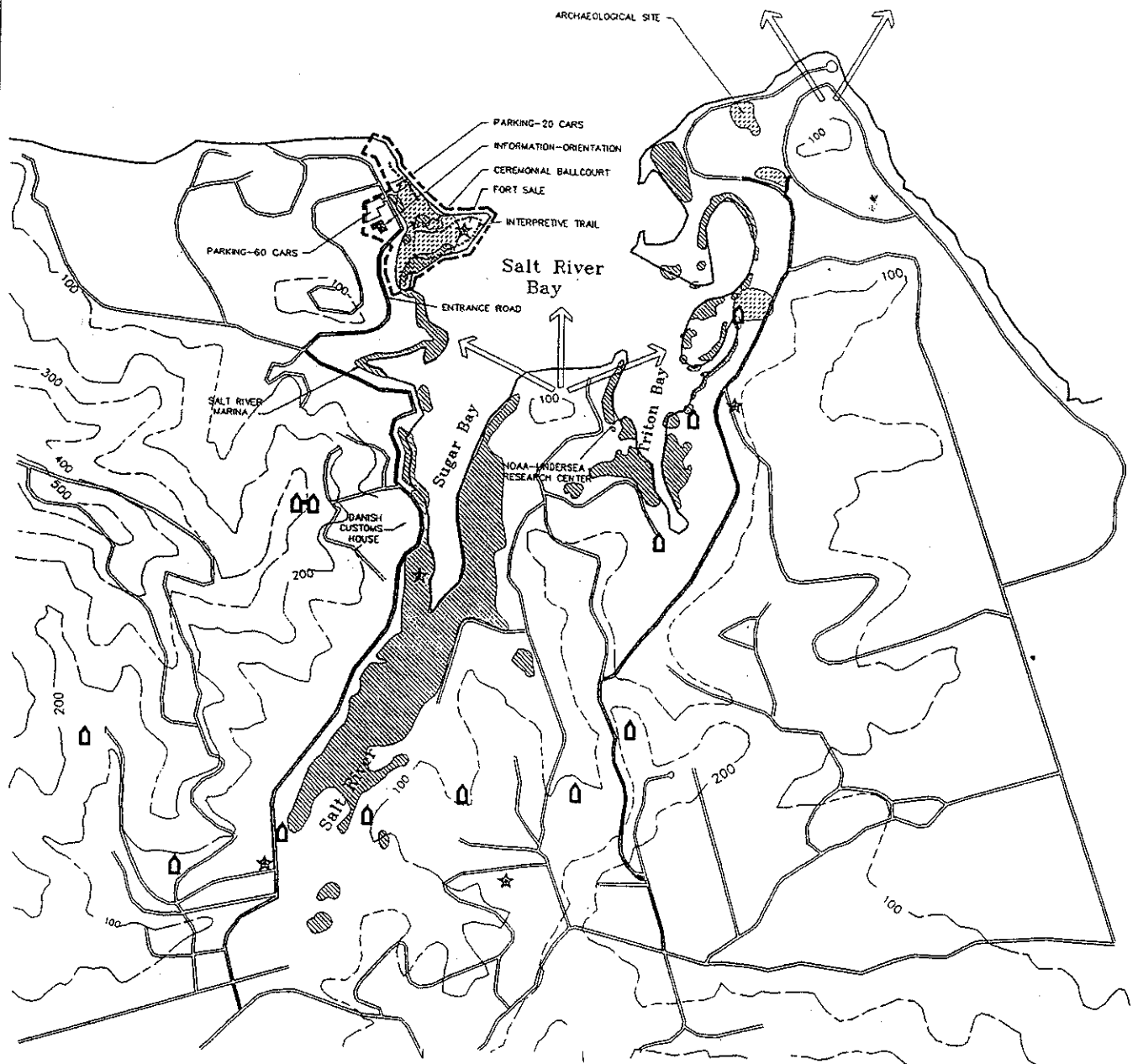
SALT RIVER DEVELOPMENT CONCEPT

ALTERNATIVE "A"



LEGEND

- PRE COLUMBIAN ARCHEOLOGICAL SITE
- ENGLISH SETTLEMENT SITE FROM SPANISH MAP (1647)
- MAJOR ENGLISH SITE
- FRENCH SETTLEMENT SITE (1671)
- SENSITIVE NATURAL AREAS
- TRAIL
- UNIT BOUNDARY
- SHORELINE



- * Pre-Columbian peoples, their exploration and arrivals, settlements, living situations, crafts, intertribal conflicts, interface with Columbus, post-Columbian conflicts, departures, current status.
- * Columbus' voyage and Salt River visit, battle at Cape of the Arrows, documentation of conflict and location.
- * Post-Columbian influences on the "New World," including the many varied changes that occurred which were related directly to the new culture.
- * European forts, including Dutch construction, French occupation, and conflicts with other nations; also including the later Danish fortress.
- * European settlement on lands earlier utilized by the native Indians, including types of commercial enterprises.
- * Recreational uses of the beach and adjacent waters in the form of sunbathing, swimming, snorkeling, and nature study.

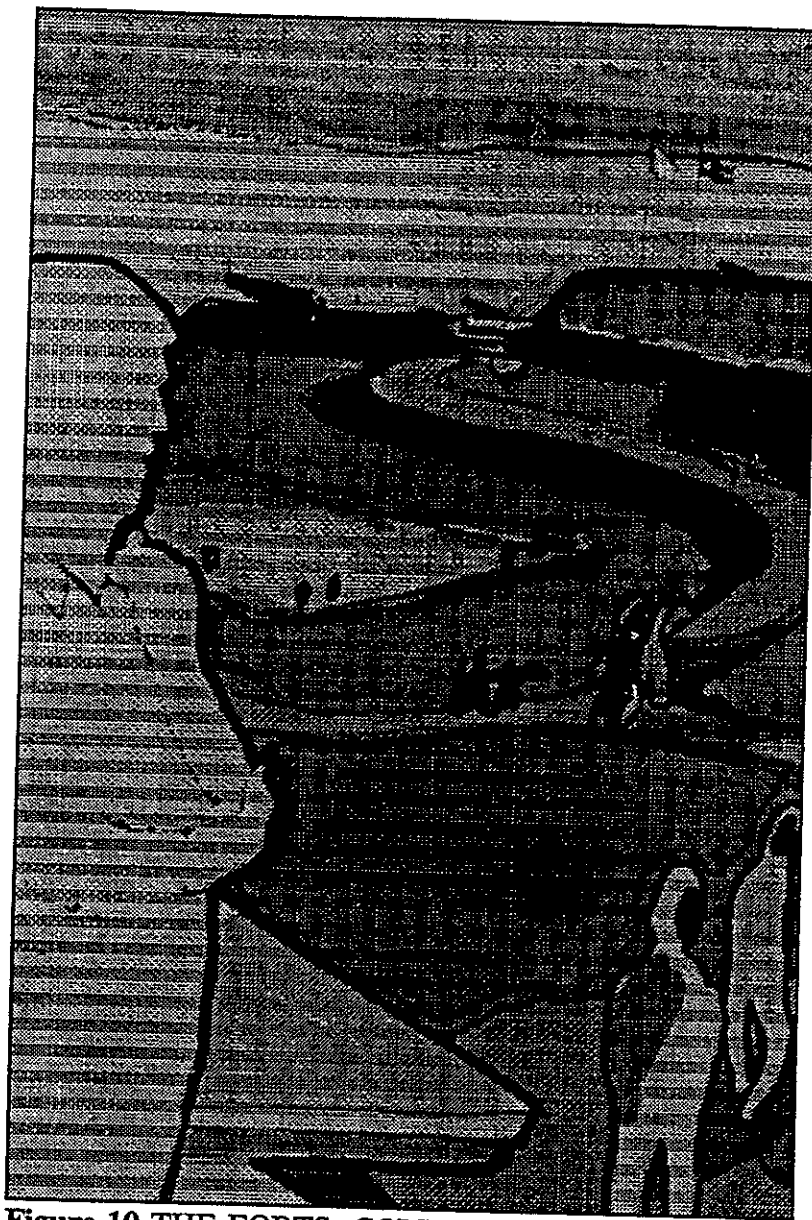


Figure 10 THE FORTS: COLUMBUS LANDING SITE

Visitor Experience. The design of this park should create a sense of historical perspective for park visitors. The visitor should be made aware of the importance of the site which contains more than 1,000 years of history, beginning with the earliest inhabitants, their

amazement at the arrival of 17 ships, the Columbus discoveries, the conflict that occurred with the natives, and the European activities and settlements that ensued.

Visitor Information/Orientation/Interpretation. The park's size and the broad expanse of the primary resources limit what can be accomplished on this small site. A single information/ orientation station should be located so that it will not impinge upon the key resources. This structure would house an information desk and sales space for pertinent publications and exhibits designed to tell the broad multicultural story of the site. It also would serve for visitor use and site protection.

Trails emanating from the information/orientation station are included in this alternative. These would provide opportunities for visitors to walk around the Indian village, to visit the ceremonial ball court, and to visit the old fort sites. Interpretation should be undertaken in two ways: (1) copies of an attractive brochure will provide an interpretive message keyed to guideposts on a predetermined walking route through the village and to the fort; (2) wayside exhibits should be utilized for additional, more detailed interpretations of the ball court and fort sites. Electronic message interpretation is not desirable because of the high humidity and salt water corrosion at the site.

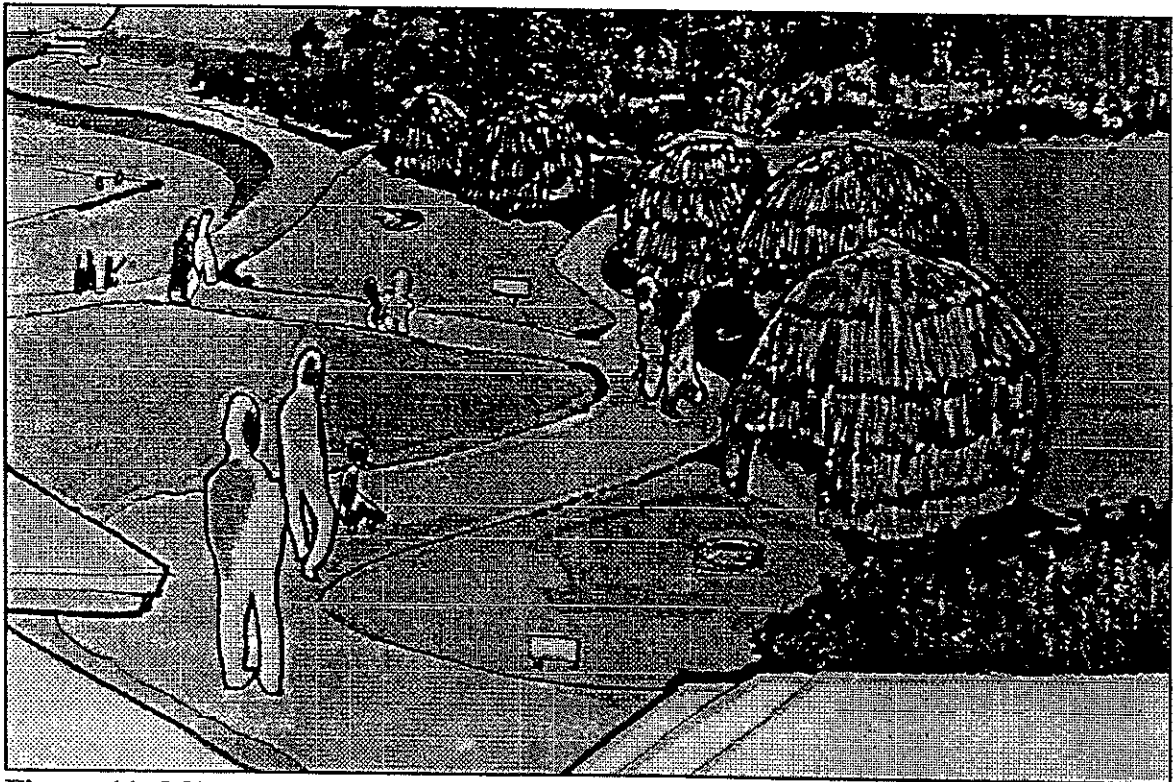


Figure 11 COLUMBUS LANDING SITE: "Interpretive Demonstration Area" - Indian Village Site

Visitor Capacities. A Columbus Landing Site Park undoubtedly will receive international attention because of the abundant activities planned for the site during the 1993 commemorative period. On certain days during 1993, the site is expected to experience visitation greater than it could withstand on a continuing basis. However, visitor capacities during "normal" peak periods are unlikely to exceed the 40- to 60-car parking area situated near the information station. Beach use also may be limited by spaces available within the beach parking lot.

Lands and Water Protection. The Columbus Landing Site Park provides protection of the significant historic resources there, and also provides for continuation of beach use to the degree that the vegetation and beach do not decline below the current condition. Because of the impacts that presently occur upon the archeological resources along the edge of the Indian village and at the fort site, vehicle use should be limited to one roadway. This alternative does not include any provision for marine resource protection beyond the Columbus Landing Site beach.

There are no businesses within the boundaries of Alternative A. Adjacent businesses outside the boundaries would continue to operate as usual.

Natural resources will be managed with a concern for fundamental ecological processes as well as for individual species and features.

Some stabilization of the littoral forest along the beach would be required. A monitoring program to assure long-term vegetation protection should be developed and implemented.

Cutting of mangroves or trails through the mangroves for boat haulouts or for any purpose other than the planned management or use of the area should be prohibited.

Operations Facilities. A park office with visitor rest rooms should be incorporated into a single visitor information/ orientation station. This facility will serve as the hub for visitor activities. As such, it would be designed for easy entry and exit to encourage use of the interpretive trails and waysides. Space within this facility will be set aside for maintenance functions and the storage and repair of equipment.

Trails should be planned so that they do not impact on the area's resources. They should be designed for easy walking with an adequate number of signs keyed to an interpretive brochure available at the information station.

Phasing. Immediate attention should be given to the acquisition of approximately 15 acres of land from nine landowners adjacent to the 5 acres already owned by the V.I. Government (National Historic Landmark). None of the 14 tracts necessary to establish a viable park currently contains homes or other structures.

Acquisition, design and construction can begin only after the necessary authorizing legislation is adopted and funds are available. Development and construction activities should commence as soon as possible in preparation for the commemorative activities planned for 1993. Phasing of development can be accomplished with highest priority given to the information/ orientation station along with parking lot, roads and trails. Other development can be spread over a 2- to 5-year period.

Compliance procedures are detailed in the environmental assessment portion of this document.

Operating Costs and Staffing. Annual operating costs are estimated to be approximately \$378,000 with an employment level estimated at approximately 12 FTEs (full-time equivalency) once the park becomes fully established. Staffing will be phased in accord with operational needs. Approximately \$100,000 in nonrecurring costs, primarily associated with debris removal and cleaning of the area, also are expected. (See Appendix for details of these associated costs.)

Alternative B: COLUMBUS LANDING SITE AND CAPE OF THE ARROWS PARK

Overview. The Cape of the Arrows is a vital component of the Columbus "discovery" story. Recent archeological surveys have revealed that the Cape section contains what may be the most significant nonimpacted, multicultural archeological site remaining on St. Croix.

The Cape of the Arrows contains a much larger landbase, with abundant natural and cultural resources. Therefore, it presents more diverse opportunities than the smaller Columbus Landing Site.

For example, the recent recognition of an additional archeological burial site, the potential for additional discoveries of seventeenth century archeological resources, and a small section of nonimpacted shoreline, provide other important pieces of the mosaic of cultural and natural resources that occur on the eastern shore. It is the value of these additional resources and greater opportunities that the dual unit park addresses.

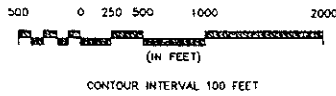
Perhaps the most important aspect of Alternative B is the opportunity to preserve the "historic scene" that is vital to the understanding of why pre-Columbian peoples chose the Salt River area as a place to settle. Those same reasons relate to the importance of the area to residents and visitors today.

Unless the Cape of the Arrows is given protection, commercial development interests surely can control the entire area. The development of a multi-storied hotel, condo units, and marina at the Cape (as is currently proposed and allowed by local zoning) or subdivision into small building lots could eliminate any chance of retaining even a portion of the historic Columbus landing scene.

The boundary of the Cape section encompasses approximately 110 acres of land of which 74 acres are purportedly owned by Sugar Bay Land Development, Ltd. The inclusion and acquisition of these 110 acres would permit the development of a Cape park section utilizing the St. John Estate entry route without impacting upon the Judith Fancy Estate on the east.

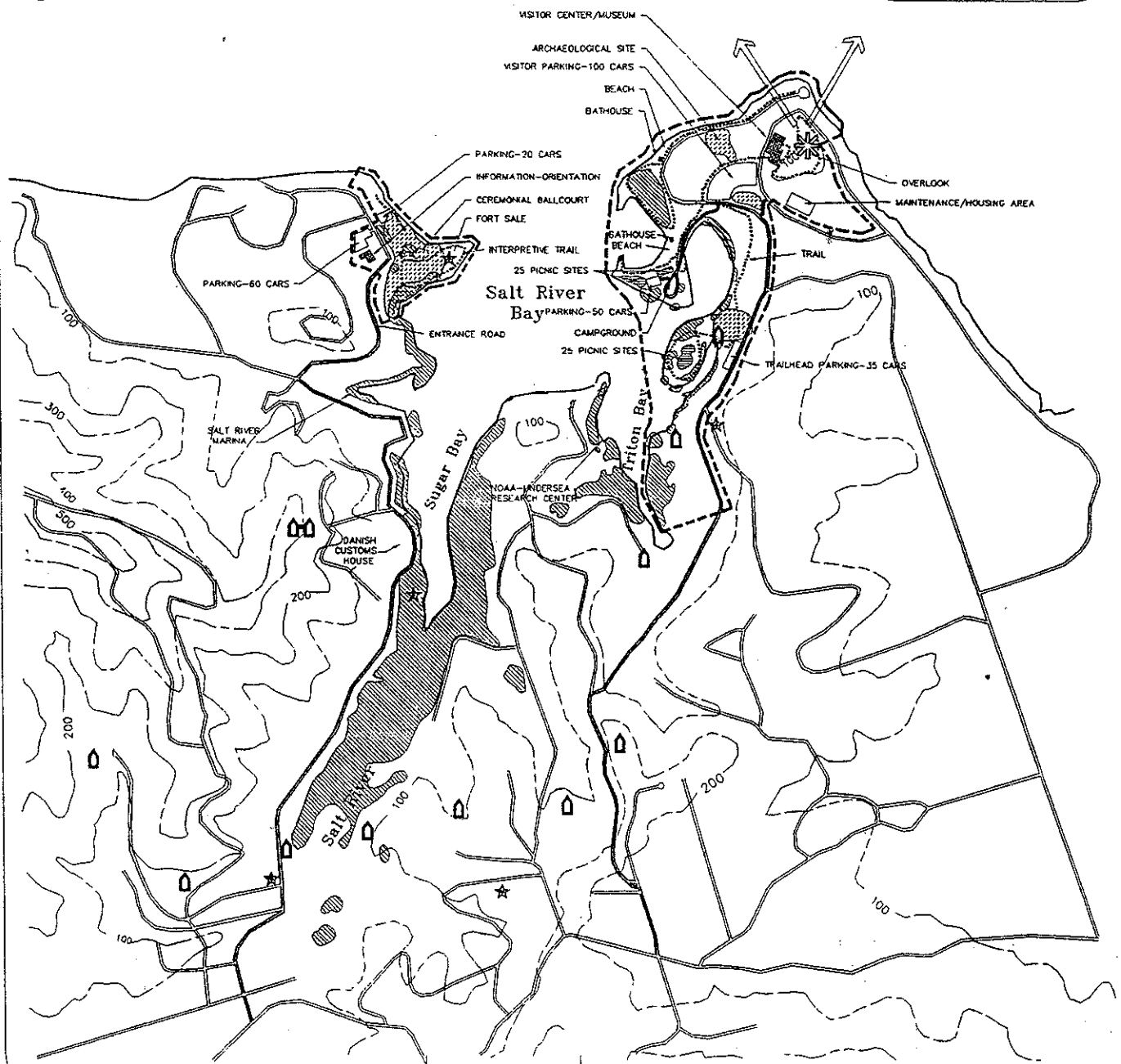
A visitor center would provide a central location for park information, interpretation, collections and document storage. Sales items, including Carib and other crafts, would be available at the center. The importance of this complex must be understood in relation to its function as a community symbol for protection and perpetuation of Cruzan heritage. Professional curation of the collections will be necessary, and the operations of this complex must be undertaken in a manner that will provide for preservation and collection security.

SALT RIVER DEVELOPMENT CONCEPT ALTERNATIVE "B"



LEGEND

- PRE COLUMBIAN ARCHEOLOGICAL SITE
- ENGLISH SETTLEMENT SITE FROM SPANISH MAP (1647)
- MAJOR ENGLISH SITE
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The Cape of the Arrows visitor center would be recognized as a "vault" for holding the artifacts of Cruzan heritage. Pre-Columbian artifacts and post-Columbian examples of Afro-Caribbean contributions to the Americas could be incorporated into exhibits that demonstrate the continuity of the native cultures of the Virgin Islands. The entrance roadway to the heart of the Cape section should be a well landscaped greenbelt of native vegetation. Fencing of the route would be necessary to define the boundary and to provide security for the park resources as well as adjacent homeowners. Law enforcement and maintenance responsibilities along this parkway would be the responsibility of the managing agency.

Historical Resources. The keystone resources at the Columbus Landing Site remain the same as Alternative A, but the increased size of Alternative B (inclusion of the Cape), will add three significant historic resources. First, inclusion of the Cape of the Arrows will provide for a partial preservation of the historic scene (discussed above) that would not be possible otherwise. Second, the northwestern flatlands of the Cape contain burials that warrant further study. A brief assessment of this area suggests that the area may contain the last significant, relatively undisturbed prehistoric cemetery site on St. Croix.

Finally, the potential for discovery of archeological remains of seventeenth century homesites could add to the continuum of history from pre-Columbian settlement through the European occupation period into the present. The Knights of Malta and the French, English, Danes and Americans all have utilized the area.

Natural Resources. Like Alternative A, this park with two units is principally a historic resource. However, the addition of the larger Cape of the Arrows area would provide a much greater opportunity to address a holistic perspective because the sea and bay are so much more in evidence. In the beginning, it was the natural resource base that encouraged settlement and supported a population of Indians and Europeans.

Columbus anchored his 17 ships over a column of water that included corals, sponges, fishes, etc. The Cape of the Arrows figured prominently in the physical route taken by the Spanish to avoid the reefs, and resulted in the subsequent encounter with the Caribs. The complete scenario of discovery and settlement can be related easily from a natural history point of view.

The inclusion of the Nature Conservancy's property along the eastern shore of Triton Bay, which contains relatively undisturbed mangroves and upland habitats, provides an opportunity to interpret the interrelationships between the early settlers and the natural resources upon which they depended. An interpretive trail is proposed to be included to provide access and protection to this wetland area.

Park Themes. Alternative B is primarily a historic complex with important natural history subthemes. However, because of the greater landbase available, limited recreational aspects also can be included as an adjunct to a park visit. The themes represented in the dual park include:

- * Pre-Columbian peoples, their exploration and arrivals, settlements, living situations, intertribal conflicts, interface with Columbus, post-Columbian conflicts, departure, current status;
- * Burial/village site on Cape of the Arrows, utilization of the archeological site as a means to interpret its history with modern techniques and onsite activity;
- * Columbus' voyage and Salt River visit, battle at Cape of the Arrows, documentation of conflict and location;
- * Post-Columbian influences on the "New World," including the many and varied changes that have occurred;
- * European forts, including Dutch/English construction, French occupation, and conflicts with other nations; also including the later Danish battery seaward of the Dutch/English/French structure;
- * European settlement on lands earlier utilized for Indian villages, including extent and style of villages, types of commercial enterprises, etc.;
- * Relationships between colonists;
- * Cultural interchange between the Americas and European and African cultures, including contributions in the arts and food and medicinal plants from Africa;
- * Utilization of the holistic perspective to interrelate the natural geography and available natural resources to initial settlement of Salt River by pre-Columbian peoples as well as later European settlers;
- * Water use, compatible with the protection of the resources, should continue to be a viable, limited, recreational opportunity in both sections of the proposed park; and
- * Limited picnicking and camping as compatible activities in areas removed from the beaches where these activities will not impinge upon the historic scene or impact the resources and nearby residents.

Visitor Experience. This alternative will expand greatly the visitor experience from a relatively cramped one at the Columbus Landing Site to one that provides a broader visual perspective similar to the original scene, and greater opportunities for the visitor to understand why the pre-Columbian people chose the Salt River site to settle. The Cape of the Arrows section provides an overlook where the historic scene can be described adequately, as well as an area of relatively undisturbed wetlands for more intimate interpretation of the natural resources that supported the Indians, European settlers and inhabitants of today.

The increased landbase also allows space for a comprehensive visitor center/museum where the visitor can experience ongoing archeological work, learn about the archeological methods utilized, see the results of the work, and obtain a perspective of the entire process from excavation to artifact analysis and interpretation. The visitor center/museum complex will provide a full spectrum of interpretation. Visitors to the site will better understand and appreciate the continuum of history. This site also could be used for certain compatible recreational activities such as picnicking, as an adjunct to the park visit.

This alternative would allow beach camping to be discontinued at the Columbus Landing Site and moved to the manmade fill area of the Cape section. The Columbus Landing Site should be limited to day-use only. Camping occurs primarily on weekends and holidays. Limiting visitor use of the landing site section to daylight hours will allow for continued sunbathing, swimming, and other day uses there. Construction of minor rest room/bathhouse facilities near the beaches should help to maintain clean, safe, and sanitary conditions.

Visitor Information/Orientation/Interpretation. The Columbus Landing Site will remain the same as described for Alternative A. The Cape of the Arrows is proposed to include an additional series of information, orientation, and interpretation sites as follows:

- * Entrance parkway should contain a pull-off at a location above the property owned by The Nature Conservancy that will allow for view of the bay and mangroves. A covered exhibit could be utilized to interpret the natural setting and provide an introductory message regarding the use of the natural resources to support human settlements. If The Nature Conservancy concurs, a narrow loop nature trail into the mangroves and adjacent woodlands would be included;
- * A small, open-air orientation station and parking lot may be constructed at a suitable site on the south end of the altered flatlands;
- * A principal visitor center overlooking the bay and ocean is envisioned further north on the hill above the open flatlands. This structure should be built to fit into the topography in a way that does not disturb the historic scene, or encroach on archeological remains. The overlook should be positioned so that short trails lead to

ongoing archeological excavations. Trails around the top of the hill should begin from the rear of the structure;

- * Exhibits within the visitor center will provide a thorough, broad message about the historical and natural features of the Salt River area. The exhibits should provide sufficient incentive to encourage the visitors to walk to the ongoing archeological dig site for a more in-depth message;

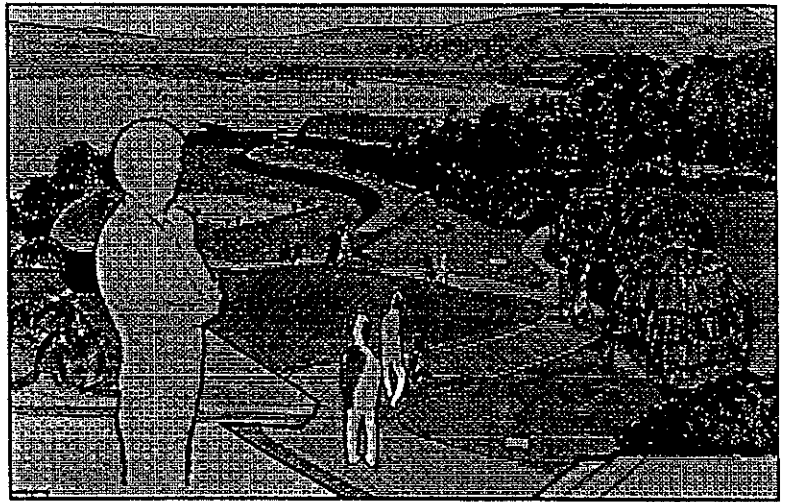


Figure 13 COLUMBUS LANDING SITE: Developed Area

- * The archeological site should be readily available to visitors, but the trail and viewing area should not encroach on the work in progress. Also, the viewing area should be designed to be shifted as work progresses;
- * The trail behind the visitor center would lead to an overlook near the top of the hill. An interpretive exhibit there could illustrate the key scenic features and provide a broad interpretive perspective of the Salt River area;
- * Included within the visitor center would be a museum where the significant artifacts and specimens of the Salt River area will be exhibited. This facility should contain sufficient room for the various collections available through the activities of the Columbus Jubilee Committee, as well as other materials expected to be made available during the collections acquisition process. Prior to the acquisition of any artifacts, a Scope of Collections Statement will be prepared. This paper will guide the acquisition of objects and related documentation essential to achieving the purposes and objectives of the park.
- * Trails between the visitor center and information/orientation station that are routed through key historic and natural resource areas also should include a few wayside exhibits at key sites. For example, the salt pond together with its surrounding vegetation provides an opportunity to interpret a rather unique habitat; and
- * A mangrove habitat interpretive loop-trail could run from the orientation station along the entrance road into the mangroves, littoral forest and adjacent woodland. This

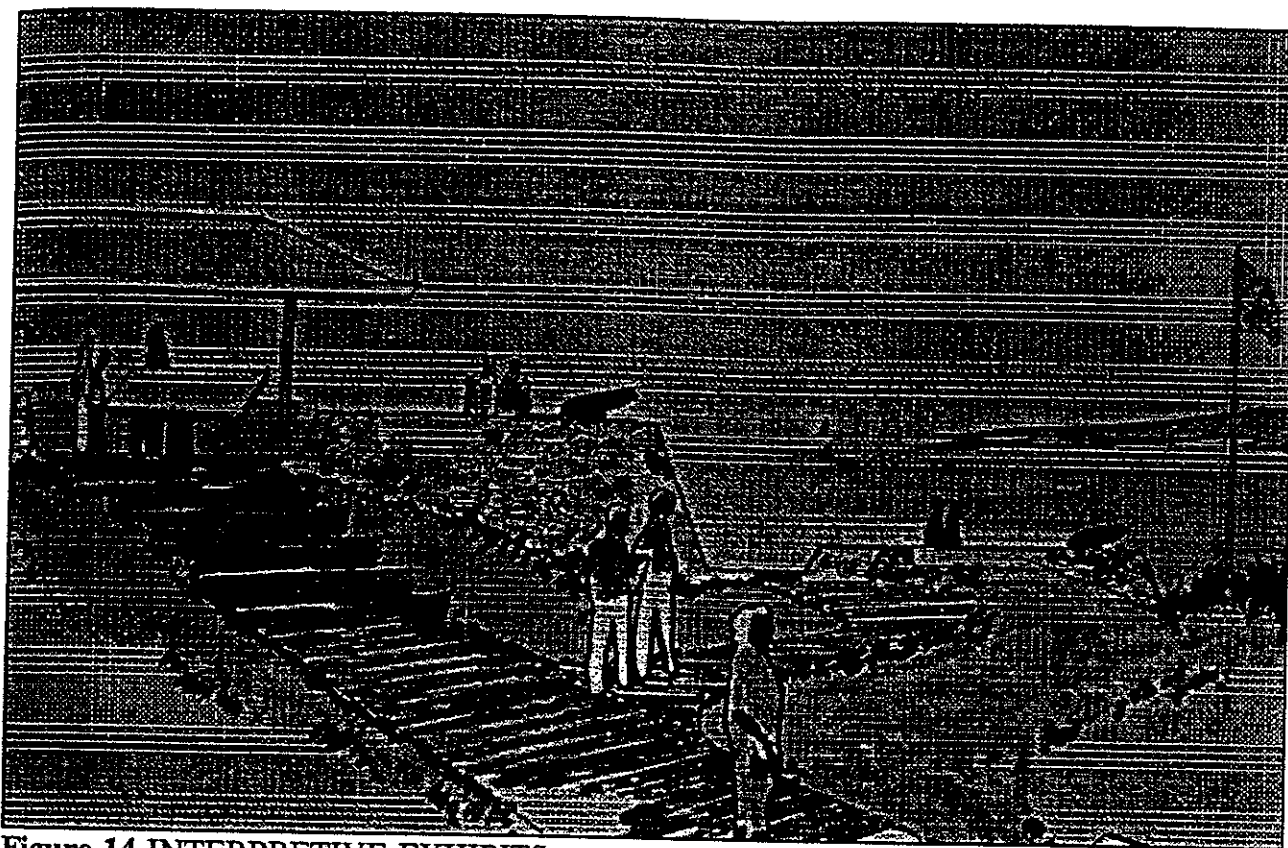


Figure 14 INTERPRETIVE EXHIBITS

route would provide an excellent opportunity to interpret the natural character of Salt River's terrestrial habitat and would help visitors understand the interrelationships between the land and water ecosystems and how early settlers and the people of today depend upon those natural resources.

The principal visitor use area would be at the Cape of the Arrows visitor center/museum. Parking at that site should provide enough space yet be limited to a certain number of vehicles appropriate to the facilities.

Swimming and other beach uses would be controlled by available parking spaces. No additional parking will be provided.

Land and Water Protection. Alternative B allows for greater resource protection and utilization. Means for protecting the resources at the Columbus Landing Site section are addressed in the section on Alternative A.

There are no businesses within the boundaries of Alternative B. Adjacent businesses outside the boundaries would continue to operate as usual.

The park will seek to restore, maintain, or enhance the quality of all surface and ground water within the park consistent with the Clean Water Act (33 USC 1251 et seq.) and other applicable Federal and territorial laws and regulations. Management actions should include but are not limited to:

1. Adequate sewage treatment and disposal for all public use and administrative facilities;
2. Management of human activities to control erosion;
3. Regulate and control activities having a high potential for water pollution such as fuel burning watercraft and marina operations;
4. Minimize the risk of water contamination from toxic substances such as pesticides, petroleum products, and heavy metals; and
5. Controlling direct pollution by livestock by eliminating streamside pastures and associated watering sites on natural waters whenever possible.

At the Cape of the Arrows, additional security may be required to help protect the area's significant historical and natural resources. Adjacent homeowners also should be assured that the park does not pose a threat from those using the park overnight.

Fencing of the east boundary line along the Judith Fancy Estate is essential to limit inappropriate entry into the estate and to provide greater security for adjacent homeowners who already have a gated and guarded entrance to their subdivision.

Full-time security will be essential for the Cape section because of the extensive museum and exhibit and sales operations and other facilities there. Park ranger housing would be required at a suitable place that does not impinge upon the historic scene or impact on the natural resources or view from Judith's Fancy.

Construction of a beachside structure, complete with rest rooms, showers and changing rooms, will help maintain sanitary conditions on both the land and waters.

Operations Facilities. The dual unit park would allow for increased facilities for interpretation and museum purposes. All of the Columbus Landing Site facilities discussed previously will remain the same and will be enhanced by the additional facilities proposed for the Cape park.

On the Cape of the Arrows unit, the following facilities are proposed:

- * The entrance road should access the proposed parking lot at the orientation station, and continue on to the visitor center. Side roads would be needed to service the park's housing and maintenance area, as well as the beach camping and picnic areas;
- * An orientation station and parking area along the entrance road. The station should be large enough to contain (1) exhibits of a general nature that will introduce the purpose of the park and provide orientation to visitors, (2) a trailhead for the mangrove loop trail, and (3) a place to disperse general park information and brochures. Parking at this station will require space for only a few vehicles at one time;
- * Two small beach bathhouses with showers and rest rooms near the crescent-shaped swimming beach. These small structures should be unobtrusive but readily available for access to the beach from the parking lot at the visitor center and from the picnic area. Parking for only a few cars will be required;



Figure 15 VISITOR CENTER: Cape of the Arrows

- * The visitor center/museum would be the park's primary structure. It will provide multipurpose functions of information, interpretation, collections storage, and administrative offices. This structure is proposed for location on the hillside just above the flatlands containing the ancient burials. The structure should be low enough to blend into the terrain so that it does not impinge upon the historic scene, but high enough to provide a view of the flatlands and the mouth of the bay. The adjacent parking area should be of sufficient size to hold vehicles for visitor center users as well as individuals utilizing the adjacent trails and swimming beach.
- * Ranger housing should be located adjacent to the visitor center/museum so that its presence will enhance the security of the facilities;
- * A maintenance area also should be located in an unobtrusive setting in an area adjacent to the residences;
- * Trails and interpretive exhibits at various locations are necessary. Trails should be designed to allow visitors to walk between the park facilities. They also should be designed so that they do not impact upon major resources but allow for easy access. Two interpretive trails will emanate from the visitor center complex, one to the archeological dig site on the flatlands below the building, and the other to an overlook area on the hillside behind the visitor center; and
- * A nature trail is envisioned from the orientation station into the mangrove/littoral forest/upland woodland area currently owned by The Nature Conservancy. This loop trail will introduce visitors to the special characteristics of these habitats and how they interrelate to the remainder of the Salt River Bay environment.

Phasing. The first phase involved in the development of this dual unit park would be the acquisition of required land, followed by the development and construction of priority facilities in time to establish a viable park by 1993, the Quincentennial year. Acquisition, design and construction can begin only after the necessary authorizing legislation is adopted and funds are made available.

The phases are summarized as follows:

1. Purchase of approximately 74 acres of land from Sugar Bay Land Development, Ltd., along the eastern portion of the unit. This land includes the entire Cape of the Arrows area, acreage south along the Triton Bay shore, and the access route through Estate St. John. This purchase will be of highest priority because of the immediate concern for protecting the entire Salt River area from development. No homes or usable structures presently exist on the property proposed for acquisition.

2. Purchase of approximately 15 acres of land (14 tracts) on the Columbus Landing Site section from nine landowners. No homes or other structures presently exist on these properties.
3. Proceed with the development of facilities for both park units as generally described within the preliminary Development Concept Plan. Detailed Design and Construction Plans can be finalized for the park units as soon as funds are made available following land acquisition. Development phasing, in addition to items listed in Alternative A, should focus initially on the entrance road to the Cape of the Arrows, the visitor center/museum, the visitor center parking lot and maintenance facility. Other development can be spread over a 2- to 5-year period.

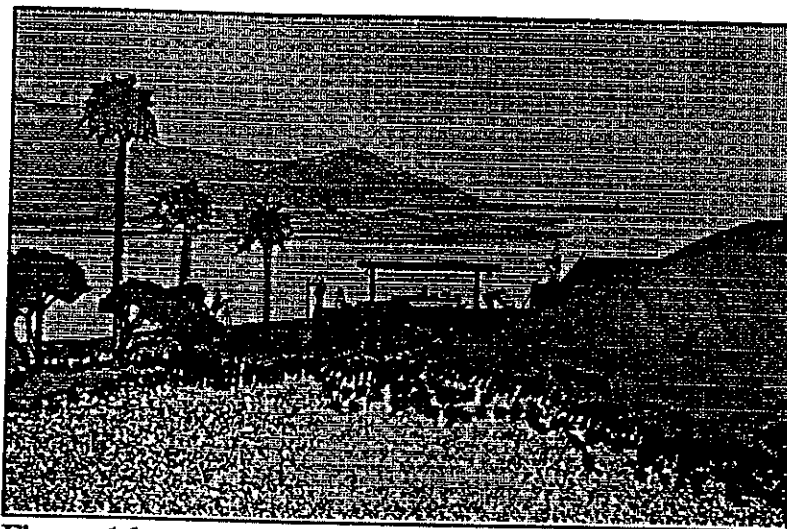


Figure 16 ARCHEOLOGICAL SITE: Cape of the Arrows

Compliance procedures are detailed in the environmental assessment portion of this document.

Operating Costs and Staffing. Annual operating costs are estimated to be approximately \$624,000, with an employment level of approximately 18 FTEs (full-time equivalency) once the park becomes fully established. Staffing will be phased in accord with operational needs. Approximately \$350,000 in nonrecurring costs are expected, primarily associated with the removal of an abandoned motel. See Appendix for details of associated costs.

Alternative C: COMPREHENSIVE SALT RIVER PARK

Overview. Alternative C includes all of the historic lands--the Columbus Landing Site and the Cape of the Arrows--that are included in Alternative B. It also incorporates the entire Salt River Bay shoreline and its associated floodplains and a portion of the adjacent uplands. It also gives consideration to the eventual creation of designated greenbelts that would

SALT RIVER DEVELOPMENT CONCEPT ALTERNATIVE "C"

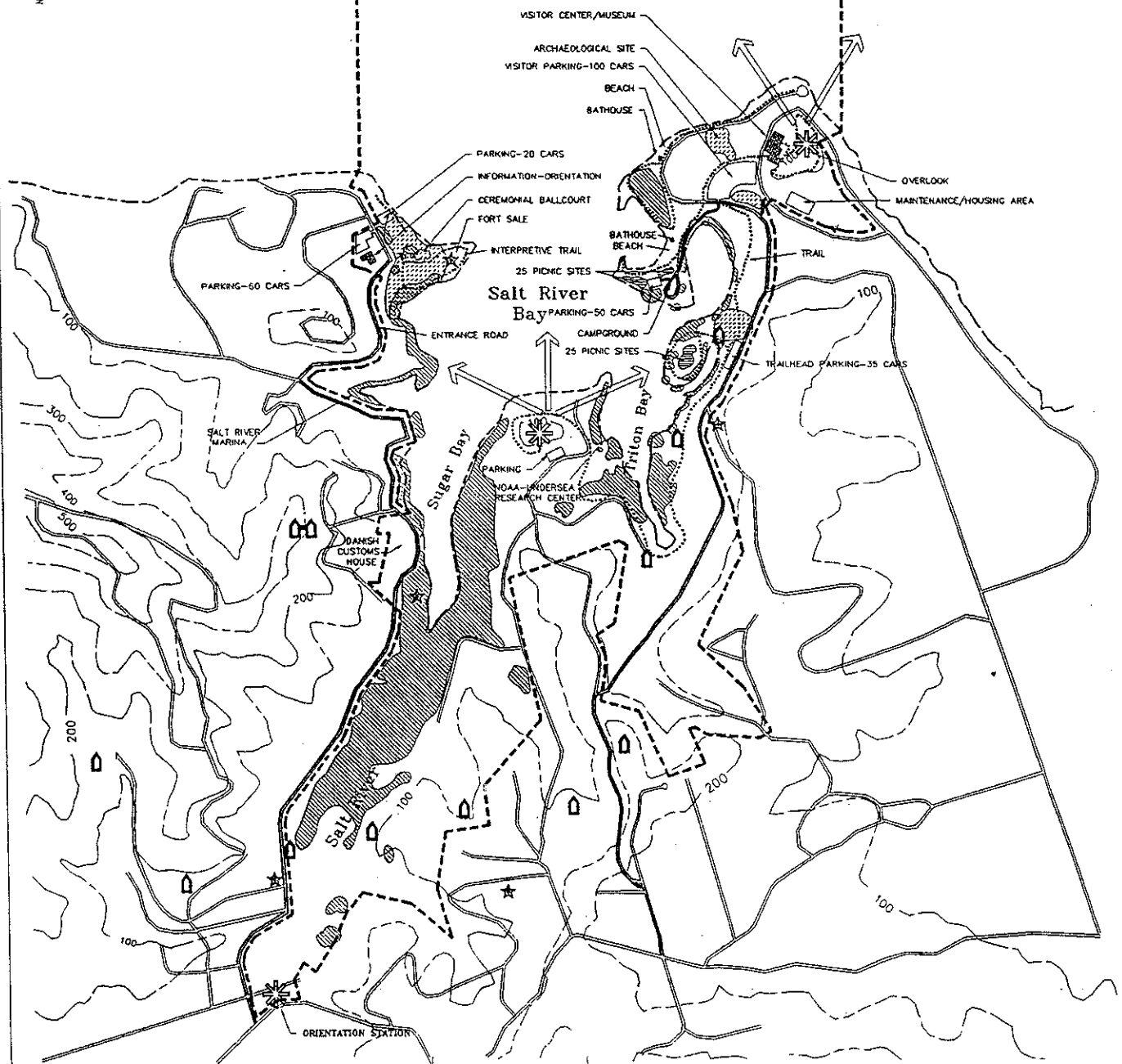
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CONTOUR INTERVAL 100 FEET



LEGEND

- PRE-COLUMBIAN ARCHEOLOGICAL SITE
- ENGLISH SETTLEMENT SITE FROM SPANISH MAP (1647)
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connect other future territorial park sites elsewhere on the island using the loop route to the west along the north shore of St. Croix and the scenic road along the crest of the mountains.

The Comprehensive Salt River Park, in addition to the above, would incorporate the entire estuarine system from the interior finger bay environments of Sugar and Triton Bays, the Salt River Bay proper and the outer bay and reefs, including the submarine canyon to a depth of approximately 300 feet. This 300-foot depth would include all of the reef-building corals. A possible extension of the marine boundary westward along the coast eventually may be necessary to provide adequate protection to the coastal resources within a marine sanctuary designation.

The interior (southern) boundary of the Comprehensive Salt River Park extends southward along the western shoreline to the junction of the North Shore and Northside Roads (Routes 75 and 80). The southeastern boundary line follows a jagged line between the southwestern corner and the St. Johns Road, excluding as many developed properties as possible (see Alternative C Map). It will also include the peninsula and the western slope of the ridge between Sugar and Triton Bays.

Sugar Bay is the last remaining reasonably well protected, intact mangrove habitat within the Virgin Islands, and its importance as a wildlife refuge should be given high priority. The U.S. Fish and Wildlife Service already has assessed the habitat and surveyed the lands necessary for acquisition, and has recommended it for national wildlife refuge¹ designation (internal memorandum). The boundary of the Comprehensive Salt River Park includes the entire recommended area.

In addition, the NOAA Office of Ocean and Resource Management has expressed interest in the inclusion of Salt River Bay and its reef system in their National Marine² or National

¹The National Wildlife Refuge System is the world's largest and most diverse collection of lands set aside specifically for wild animals. These refuges are managed for migrating waterfowl, endangered species, unique ecosystems, nongame wildlife and for compatible public uses.

²The National Marine Sanctuaries program was established for the purpose of preserving or restoring marine areas for their conservation, recreational, ecological, or aesthetic values. Both existing and potential uses that are compatible with the primary purpose(s) for which the sanctuary is established could be allowed. Uses would be explored on a case by case basis.

Estuarine³ Sanctuary Program. The inclusion of the entire Salt River marine system in the Comprehensive Salt River Park may provide a greater possibility for such future designation. It is also possible that Sanctuary designation may extend west of Salt River Bay to include the reef system at Cane Bay, along with an extension farther west to include the Hams Bluff reef system.

Historical Resources. Major historical resources at the Columbus Landing Site and Cape of the Arrows sections remain the same as Alternatives A and B. They include at least one additional historic site of importance--the Danish Customs House. This 1780s structure existed along the western shoreline near the mouth of Sugar Bay. It played an important role in the import-export activities that occurred at Salt River at that time.

Preliminary archeological surveys of the interior lands contained within the boundary of Alternative C suggest that other important cultural remains also may exist. For example, the peninsula between Sugar and Triton Bays contains archeological sites that require additional study to determine their significance.

Natural Resources. The greatest importance of this alternative is the inclusion of the Salt River natural system continuum which contains freshwater streams, wetlands, upland forest habitats, mangroves, salt ponds, estuaries, bays, and deep water habitats, including the unique submarine canyon. The coral reef and gardens west of the Salt River mouth as far as Cane Bay also are extremely important because they represent the last remaining series of relatively undisturbed reef systems on St. Croix. This larger area meets many qualifications for protection as a National Marine Sanctuary.

Sugar Bay is a key component of Alternative C because of its outstanding mangrove forest habitat. The Sugar Bay mangroves represent the last remaining intact mangrove system in the USVI. Although it is relatively small, it is bordered by hillsides and floodplains that have not yet been intensely disturbed. The forest of black, white and red mangroves and the many additional plant species, including the unique stand of Swamp Fern, form a floral assemblage that will remain only as long as the area is protected. Increased development anywhere in the Salt River system undoubtedly will threaten the special character of the Sugar Bay environment.

³The primary purpose of estuarine sanctuaries is to provide long-term protection for natural areas so that they may be used for scientific and educational purposes. Multiple use of estuarine sanctuaries is encouraged to the extent that such use is compatible with the primary sanctuary purpose.

Sugar Bay also provides extremely important nesting and wintering sites for a large number of birds, one of the better indicators of habitat conditions. Sugar Bay mangroves contain the most extensive nesting population of the locally threatened White-crown Pigeon anywhere in the Caribbean. During the winter months, the mangroves provide habitat for as many as 23 species of songbirds. North American songbirds that nest in the temperate areas of eastern North America spend a greater portion of their lives on their wintering grounds than they do on their breeding grounds. The protection of the Sugar Bay mangroves is essential for these species.

The value of the Sugar Bay mangroves goes far beyond the obvious flora and fauna. The Salt River mangrove system provides breeding and nursery grounds for a vast array of marine fisheries. The loss of the Salt River system undoubtedly would have serious effects upon food fishes, lobsters, and other fisheries that already have reached a serious low in the USVI. Long time fishermen on St. Croix relate the great decline in St. Croix's south shore fisheries with the destruction of Krause Lagoon, a Salt River analog that once existed on the south-central shore of the island.

Park Themes. All of the themes listed for Alternative B also apply to this comprehensive park alternative, but the inclusion of the marine component and the increased size of the landbase would offer additional thematic opportunities as follows:

- * An ecosystem continuum from the terrestrial watershed to the submarine canyon, including upland forests, freshwater streams and wetlands, littoral and mangrove forests, salt ponds, shallow estuaries, and a deeper bay with seagrass beds;
- * A variety of plant and animal forms that are dependent upon the long-term survival of the mangrove forest habitat;
- * A salt pond habitat, with its unique character and interrelations with the other habitats in the Salt River system;
- * The Salt River Bay system, including the seagrass beds and the great variety of flora and fauna dependent upon its long-term protection;
- * A coral reef habitat that forms the outer margin of the bay and protects the entire Salt River system;
- * A submarine canyon habitat and the numerous unique flora and fauna associated with this special geological phenomenon;
- * The interrelations between each of the natural habitats and the area fisheries that human beings depend upon for their food and enjoyment;

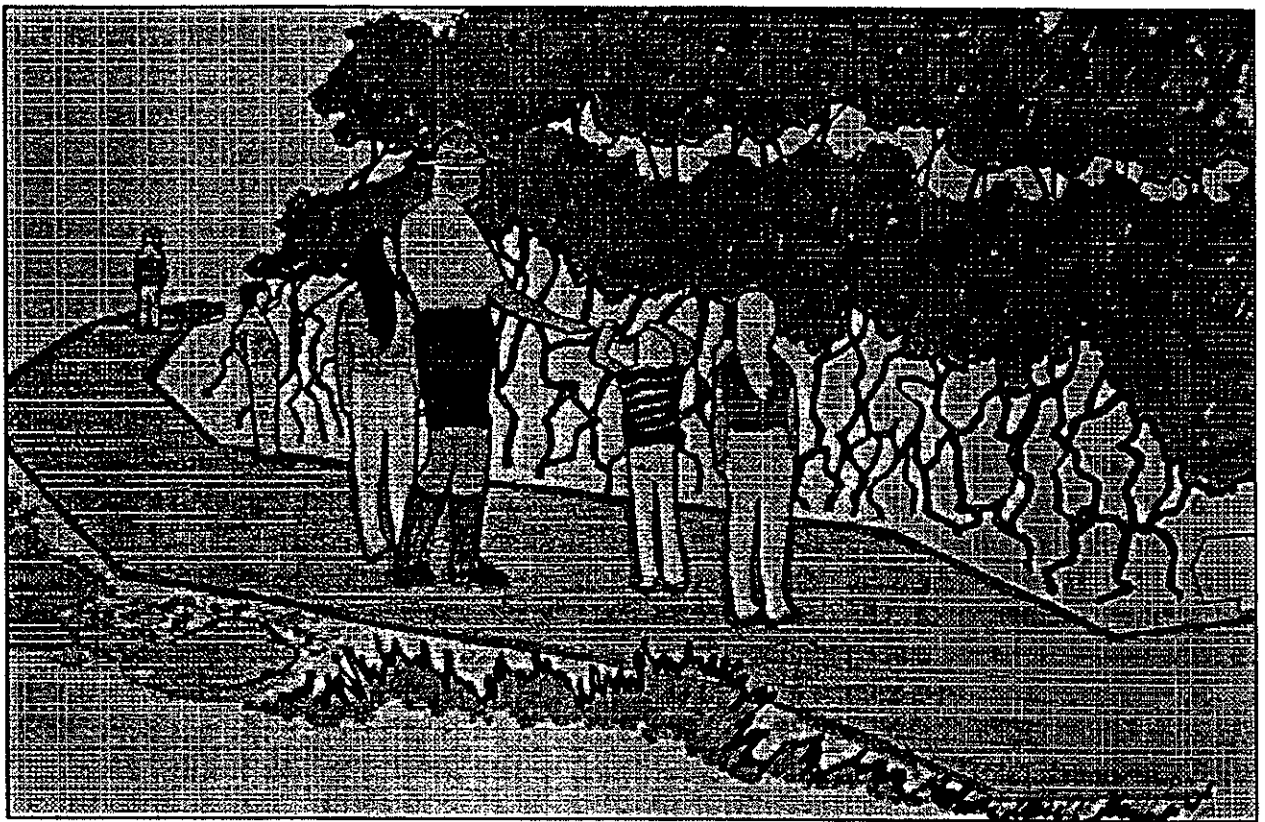


Figure 18 MANGROVE NATURE WALK

- * The endangered, threatened and unique species that depend upon the marine and terrestrial habitats of the Salt River area for their continued existence; and
- * The Danish Customs House and it's relationship to the history of the Salt River area.

Visitor Experience. This alternative should greatly enhance the opportunities available to area visitors. Inclusion of the Danish Customs House will help interpret the extent of the Danish occupation, as well as the time frame of activities within the Salt River area. The likelihood of identifying additional sites within the Salt River area is great, especially pre-Columbian sites that will help us better understand the activities of those earliest peoples.

A comprehensive Salt River Park also magnifies the possibility for understanding the holistic interrelationships between human beings and their environment. The reasons that pre-Columbians settled at Salt River were the same that caused the Europeans to utilize the area later. The natural resources available at Salt River provided the necessary food and water to support human settlements. Those same resources provide for people today, but too often are forgotten or ignored. The ingredients of this support system can be described and

understood best when they are still extant. A comprehensive park will permit an educational opportunity that would not be possible with a smaller unit.

The North Shore Road, Route 80, and Scenic Road (Route 78) provide opportunities for additional visitor experiences. Both routes can be utilized as extensions to the Salt River Park experience. The North Shore Road provides excellent views along the north coast and the Scenic Road provides magnificent vistas from numerous overlooks on the mountain crest. The Canaan Road, Route 73, provides a logical connection for an outstanding loop trip.

The Scenic Road continues westward along the mountain crest for an additional 12 miles to the West Shore Road. It provides numerous overlooks and closeup sightings of tropical mountain flora. It also may be possible to extend this greenbelt south on the West Shore Road to Mahogany Road and a larger loop back toward Salt River.

The hilly peninsula between Sugar and Triton Bays will provide an excellent location as an observation point. This point will serve important interpretive and environmental education functions. Any structure built low enough not to be an obvious man-made intrusion, but high enough to permit a panoramic view of the Salt River Bay, has great potential.

The Comprehensive Salt River Park also could stimulate various territorial and Federal agencies and private landholders to undertake a comprehensive development plan for the management of the Salt River Basin. Joint management of the Salt River Basin may be essential for the long-term survival of the Salt River System.

Visitor Information, Orientation and Interpretation. This alternative includes all of the activities described under this subheading in Alternatives A and B, and incorporates additional opportunities as follows:

- * The observation point should be located on the hilltop between Sugar and Triton Bays to provide an opportunity for interpretive and environmental education activities for visitors and local schools. A more extensive environmental education center within the area also can be considered as part of the future planning efforts for the park;
- * A centralized orientation/information kiosk is envisioned near the junction of the Northside and North Shore Roads. This open structure should offer orientation maps and pertinent displays to explain the location and importance of the various resources within the area. The information should include descriptions of the various sections, management responsibilities, the types of activities available within each section, and suggestions for visits to those areas. This orientation station should clarify the purposes of the various areas. For example, specific areas dedicated or zoned for wildlife refuge use might allow only limited visitation, and the portion proposed as a marine sanctuary might impose certain restrictions on water-oriented activities;

- * A wayside exhibit would be located near the Danish Customs House along the North Shore Road at the mouth of Sugar Bay. This covered exhibit could be utilized to interpret the historic structure and the events that occurred there during the 1780s;
- * Another wayside exhibit could be located on the hilltop at the entrance road to the Columbus Landing Site at a site where the bay and general scene can best be viewed; and
- * An orientation sign would be at the entrance to the Cape section at the junction of the Northside and Estate St. John Roads. This sign should be detailed enough to enable visitors to understand their location relative to the other parts of the Salt River reserve.

Visitor Capacities. Visitation undoubtedly will be concentrated at the two principal visitor use sites, the Columbus Landing area and the Cape section, because of the unique nature of those areas. The remainder of Alternative C (the marine areas and the hard-to-reach mangrove/woodland interior of Sugar Bay) should be managed for secondary visitor use. Their lack of easy accessibility will be utilized to provide greater protection of those important, more fragile natural resources.

Visitor use of the marine environment will continue in much the same manner that currently exists, but with greater controls. The privately owned Salt River Marina may continue to operate diving and sightseeing boats within the Salt River Park. However, utilization of park waters will require concessioner permits or commercial use licenses that limit total visits and impose conditions that will ensure protection of the marine resources. An assessment will need to be made to determine if operation at current or expanded levels is compatible with resource protection objectives.

Visitation to the natural areas of the interior will be concentrated on the central peninsula and along the eastern shore of Triton Bay. The observation point atop the peninsula will provide an excellent location for added interpretation of the entire Salt River system. A nature trail along the eastern shoreline (on what is currently Nature Conservancy land) will interpret the area's wetlands and terrestrial habitats. Trail access from the Triton Bay orientation/information station will help restrict improper use and provide for visitor direction as necessary.

The Sugar Bay section of Alternative C would be managed as a wildlife sanctuary that gives priority to scientific research and education aimed at the long-term protection of that area's significant flora and fauna. Visitation to this area should be restricted to special individuals or groups who are accompanied by park personnel.

Land and Water Protection. The protection of the significant historic resources within the Columbus Landing Site and Cape of the Arrows sections is of utmost importance. Protection strategies within these areas are the same as described for Alternative B.

Protecting the natural integrity of the Sugar Bay portion of Alternative C also is highly important. The Sugar Bay area, in a sense, will serve as a "control" for the park's natural systems. Research, monitoring and education initially should be the only acceptable activities.

Operations Facilities. All of the required facilities described for Alternative B will also apply for Alternative C. There are only four additions:

- (1) An observation point could be located atop the peninsula between Sugar and Triton Bays. It should be located at the end of a short roadway that extends from the Estate St. John Road to the NOAA Lab facilities on Triton Bay. A short trail from a parking area and exhibits are proposed for incorporation into this site;
- (2) A covered wayside exhibit is planned for the Danish Customs House site along the North Shore Road. This structure should be located on the bay so that visitors can better understand the relationship of the natural character of the waterway with the historic customs house;
- (3) A covered wayside exhibit should be located along the hilltop entrance road to the Columbus Landing Site section. This structure can be located where the bay and general historic scene can best be viewed; and
- (4) An orientation/information kiosk (shelter) should be located inside the park at the junction of the North Shore and Northside Roads. This structure should be reasonably close to the roadway and include a paved pull-out on the flat land that borders the roads to enable one to stop without creating a traffic hazard.

Phasing. Priorities for Alternative C, are generally the same as those for Alternative B, with the necessary following additions:

- (1) The acquisition of approximately 74 acres of land from Sugar Bay Land Development, Ltd., is required before the Cape of the Arrows section is developed for residential or commercial purposes. This acquisition is essential for the protection of the remainder of the comprehensive Salt River Park;
- (2) The acquisition of approximately 15 acres on the Columbus Landing Site section is necessary for the protection of the Indian village and acquisition of enough space for a viable park operation there;

- (3) Additional land acquisition to protect the Sugar Bay section and to develop a wildlife refuge should follow that outlined above. This acquisition should include all the undeveloped lands along the western shoreline between Columbus Landing Site and Sugar Bay. A Land Protection Plan will be prepared soon after authorization of the area. It will address all lands, both developed and undeveloped, within the chosen alternative. Acquisition of those undeveloped lands on the peninsula between Sugar and Triton Bays also should be undertaken to preserve that section of the area from further development and to protect a continuous shoreline; and
- (4) Park development can occur only after the necessary lands are acquired. Detailed design and construction plans should be finalized as soon as funds are available following the land acquisition stage so that development can begin at the earliest possible time. Development should be multi-phased to ensure completion of the major facilities in time for the 1993 commemorative activities. The facilities at the Columbus Landing Site section and the visitor center complex on the Cape section are of highest priority, but the entrance roads, some of the trails, and the various exhibits should be completed within the same development package.

Acquisition, design and construction can begin only after the necessary authorizing legislation is adopted and funds are made available.

Operating Costs and Staffing. Annual operating costs are estimated to be approximately \$624,000 with an employment level estimated at approximately 18 FTEs once the park becomes fully established. Staffing will be phased in accord with operational needs. Expertise in specialty fields (e.g. Natural Resource Manager) would be drawn from the Virgin Islands National Park, thereby reducing full-time staffing costs. Approximately \$350,000 in nonrecurring costs also are expected primarily associated with removal of the abandoned motel. See Appendix for details of associated costs.

PARK MANAGEMENT AND OPERATIONS

The management and operations of a Salt River Park requires professional attention if it is to be a viable park. Facilities should be developed so that the park staff and visitors can undertake activities that will protect the significant resources of the area while at the same time providing the opportunities for people to receive personal benefits from the site. Those benefits range from pure enjoyment, aesthetic and recreational, to the opportunity to learn about the important natural and cultural resources of the area. Environmental education should be an important ingredient in the operations of the Salt River Park.

Park Management

Personnel necessary to operate a park varies considerably with the three park development alternatives. The total number of park employees varies with the alternative selected and may require as few as 12 individuals for the smallest park to as many as 18 individuals for a fully staffed comprehensive park. The comprehensive Salt River Park of approximately 1,000 acres eventually may require up to two times the number of personnel as would be required to operate the smallest 20-acre Columbus Landing Site. According to the concept in the Virgin Islands' legislation, the NPS would operate the park for 10 years, during which time USVI personnel would be trained to operate the Salt River Park as a territorial park. The NPS coordinators for the management and training could be as few as three individuals or as many as eight to ten, again depending upon the park alternative chosen. The USVI trainees would fulfill some of the basic functions of the park operations during the time they are undergoing training.

Administrative positions required for the operation of the smallest Salt River park would include only an administrative clerk and a clerk-typist.

Maintenance positions required would include a supervisory maintenance mechanic foreman and no more than six additional maintenance workers, depending upon the size park selected. The smaller park might require only four additional maintenance persons to care for the area.

Protection and interpretive personnel would increase if the Cape of the Arrows was included within the park. Because of the proposed principal visitor center/museum complex, and increased natural and cultural resources needing protection, the number of rangers would vary from five to eight.

Under the I&RM (interpretation and resource management) system, rangers would be cross-trained in both law enforcement and interpretive duties to reduce costs for additional personnel.

Resource Management personnel with expertise in natural science and historic site management would be drawn from the Virgin Islands National Park for scientific projects and counsel on management of the area.

ALTERNATIVES ADDRESSING PARK MANAGEMENT

A method of management for a Salt River Park was addressed in Act Number 5229 (12/29/86) of the 16th Legislature of the U.S. Virgin Islands (Appendix L). It called for the NPS to coordinate a planning process to determine the size and details of a Salt River Park, and then develop and operate the park for 10 years. At the end of the 10-year operating period, the management of Salt River Park would be assumed by the USVI. Subsequently, an agreement between the NPS and the USVI also included the planning of a Territorial Park

System to be coordinated by the USVI (Appendix K) with assistance from the NPS. The Salt River Park is to be the "centerpiece" or first completed park of that system.

This study outlines park management options for the public's review and comment. Four options are included:

- (1) NPS-Territorial Government partnership;
- (2) National Park Service only;
- (3) Multi-agency management; and
- (4) Private foundation only.

These options would be more fully explored in the legislative review process, possibly leading to an authorization by Congress.

(1) NPS-Territorial Government Partnership: This option follows the general concepts described in the introduction to this section. Area management and training of USVI employees by NPS for 10 years would be followed by complete management control thereafter by the USVI Government. Under this option, all lands acquired for the park would be dedicated to preservation of the cultural and natural values within the area and, if so directed in authorizing legislation, eventually transferred to the Territorial government. Funds for the initial activities of park development, operations and training, probably would need to be obtained through the U.S. Congress. Funds to support Territorial Park operations, after the initial 10-year period, would need to be authorized either through the USVI or as a separate appropriation from the U.S. Congress. The park would be classified as an affiliated area, as one of a select group of nationally significant areas having a formal cooperative relationship with the NPS. This type of management could be applied to each of the three alternatives (A, B or C).

(2) National Park Service only: This option would require the deeding of USVI lands within the proposed park boundary to the Federal Government, and the subsequent management of the park as a unit of the NPS. It is likely that such an operation would be administered and managed in a manner similar to Buck Island Reef National Monument and Christiansted National Historic Site. A major benefit would include the use of already available support services (administrative and clerical fields) from Buck Island and Christiansted.

To be eligible for favorable consideration as a unit of the National Park System, an area must meet certain established criteria. First, the area must contain nationally significant

natural, cultural, or recreational resources. Second, the area must be suitable for public use and feasible to administer for national park purposes. Suitability considerations also include to what extent a particular type of area or resources already is represented by existing units of the National Park System. Finally, management alternatives are considered. Even if an area is nationally significant, suitable and feasible, it may not be recommended as a unit of the National Park System if it can be managed and protected adequately by other Federal agencies, State and local governments or the private sector. This type of management could be applied to each of the three alternatives (A, B or C).

(3) Multiple agency management: This option provides opportunities to address the interests of various agencies in the greater Salt River area. The USVI already owns properties within the Salt River area, most notably the 5 acres known as the "Columbus Landing Site," and approximately 50 acres at the head of Triton Bay. The FWS has declared its interest in establishing a national wildlife refuge in the Sugar Bay area. Also, the Office of Marine Sanctuaries, Department of Commerce, has expressed its interest in Salt River Bay for a marine sanctuary.

Three possible scenarios for multiple-agency management could be considered:

- a. The USVI would become the principal manager of the Salt River Park, without holding title to all of the land. The FWS and the Office of Marine Sanctuaries still could initiate actions to obtain Sugar Bay and Salt River Bay for refuge and sanctuary purposes, but those subunits, under proper circumstances, could be managed by the USVI through cooperative agreements after acquisition or designation by each respective agency.
- b. The NPS or the FWS could serve as the principal land manager without holding title to all the lands within the boundaries of the park. Management agreements could be developed with the USVI, other agencies, and conservation groups, such as the FWS, for management of Sugar Bay Refuge and the Office of Marine Sanctuaries for management of the Salt River Estuary and Bay, or the Nature Conservancy for management of their tract at Triton Bay.
- c. A truly multi-agency management program could be developed between the several potential land managers. For example, the USVI could become the owner of the 20-acre Columbus Landing Site subunit; the FWS could become the owner of the Sugar Bay wildlife management subunit; and the Marine Sanctuary Program could possess control for the management of Salt River Bay. NPS management of other portions of the comprehensive park unit, including the Cape of the Arrows and other lands surrounding the Salt River system is a possibility. The Nature Conservancy, together with others who may want to participate, could be included within cooperative agreements under signatures of the various landowners. The legislative review

process would determine whether a commission or other governing body would be needed to oversee the combined management programs. A multiple-agency management option would be better suited to Alternative C, the larger of the alternatives.

(4) Private foundation only: The Salt River Park conceivably could be managed by a private foundation. An organization such as the Christopher Columbus Jubilee Committee might be funded by private contributors to manage the area after the 1993 celebration. Another local organization, such as the Virgin Islands Conservation Society, St. Croix Environmental Association, or Virgin Islands Audubon Society, also might be able to manage the area through the use of donated funds. In the country of Belize, for example, the Belize Audubon Society manages that country's park which is supported by donated funds from a international conservation association (the World Wildlife Fund) with a minimal amount contributed by the Government of Belize. Such an arrangement for private foundation management could be initiated via cooperative agreements with respective land holders (the VI Government, the FWS, the NPS, private individuals, groups and associations).

PART II - ENVIRONMENTAL ASSESSMENT

**COLUMBUS LANDING SITE
ST. CROIX, U.S. VIRGIN ISLANDS**

ALTERNATIVES STUDY and
ENVIRONMENTAL ASSESSMENT

AFFECTED ENVIRONMENT

The major issues of concern focus on the preservation of the area's significant cultural and natural resources and the need for sensitive, compatible development which will ensure their preservation, understanding and enjoyment in the future.

This portion summarizes known background data on the area and explores potential factors that could affect the environment, if action is taken to initiate one of the alternatives.

REGIONAL SETTING

St. Croix is located 40 miles south of the other Virgin Islands and 100 miles southeast of Puerto Rico. It lies between latitudes 17 degrees, 40 minutes and 17 degrees, 48 minutes North and longitudes 64 degrees 34 minutes and 64 degrees 55 minutes East and is the easternmost possession of the United States. St. Croix is 30 nautical miles South of the Puerto Rican Bank upon which Puerto Rico and the other Virgin Islands sit. Water depths between St. Croix and the Puerto Rican Bank exceed 15,000 feet.

Salt River is found on the north coast of St. Croix on the seaward slope of the northside mountain range. This range is approximately 10 miles long, extending from the northwesternmost coast to the coast at Judith's Fancy. Salt River lies just to the west of the Judith's Fancy area.

CLIMATE

The climate of the area is classified as subtropical with warm temperatures that range from a minimum of 67 degrees Fahrenheit to a maximum of 97 degrees.

Prevailing Winds

The Virgin Islands are within the "Easterlies" or "Trade Winds" which traverse the southern part of the "Bermuda High" pressure area. The predominant winds are usually from the east-northeast and east (IRF, 1977). These trade winds vary seasonally, and are divided broadly into four seasonal modes: (1) December to February; (2) March to May; (3) June to August; and (4) September to November. The characteristics of these modes are taken from Marine Environments of the Virgin Islands Technical Supplement No. 1, (IRF, 1977).

December through February: During the winter, the trade winds reach a maximum and blow with great regularity from the east-northeast. Wind speeds range from 11 to 21 knots about 60 percent of the time. Speeds greater than 20 knots occur about 25 percent of the time in January.

The trade winds during this period are interrupted by "Northerners" or "Christmas Winds" which blow from a northerly direction for 1 to 3 days at more than 20 knots. These systems are accompanied by intermittent rains and by clouds and low visibility for mariners.

March through May: During the spring, the trade winds are reduced in speed and blow mainly from the east. Winds exceed 20 knots only 13 percent of the time in April. The change in speed and direction results mainly from a decrease in pressure of the Equatorial Trough.

June through August: Trade winds reach a secondary maximum during this period and blow predominantly from the east to east-southeast. Speeds exceed 20 knots 23 percent of the time during July. The trend for increasing winds results from the strengthening of the Bermuda High and a concurrent lowering of pressure in the Equatorial Trough. Trade winds during this period are interrupted by occasional hurricanes.

September through November: During the fall, winds blow mainly from the east or southeast. Only 7 percent of the winds exceed 20 knots in October. The low speeds result from a decrease in the Equatorial Trough. During this period, especially during late August through mid-October, the normal trade wind regime often is broken by easterly waves, tropical storms and hurricanes.

Storms and Hurricanes

There are numerous disturbances during the year, especially squalls and thunderstorms. These occur most frequently during the summer, lasting only a few hours and causing no pronounced change in the trade winds. Tropical cyclones with wind speeds exceeding 74 miles per hour are termed hurricanes. Hurricanes occur most frequently between August and mid-October, with their peak activity occurring in September. The annual probability of a cyclone is one every 16 years (Bowden, 1974). The hurricanes that have affected the islands since 1876 are shown in Figure 19. Of these, 24 hurricanes have passed within 50 miles of the islands (U.S. Army, 1975). With the occurrence of hurricanes David and Frederick within a 5-day period in 1979, it is obvious that they are difficult to predict at best.

It is estimated that 85 percent of St. Croix's buildings had moderate-to-severe damage as the result of Hurricane Hugo (September 1989). Hurricane proof visitor facilities should be considered essential in project planning.

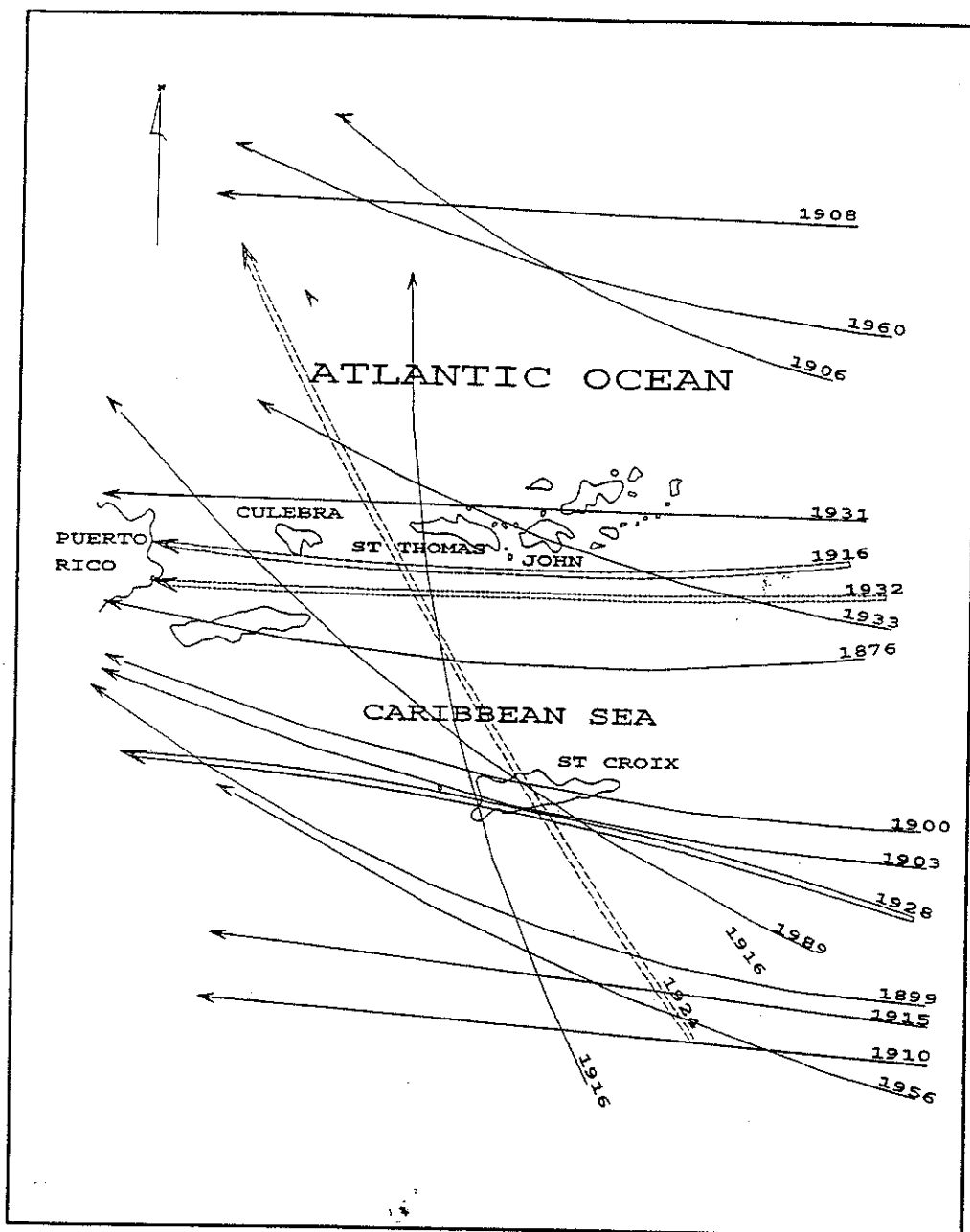


Figure 19 HURRICANE PATHS SINCE 1876, U.S. ARMY - Modified to show HUGO 1989

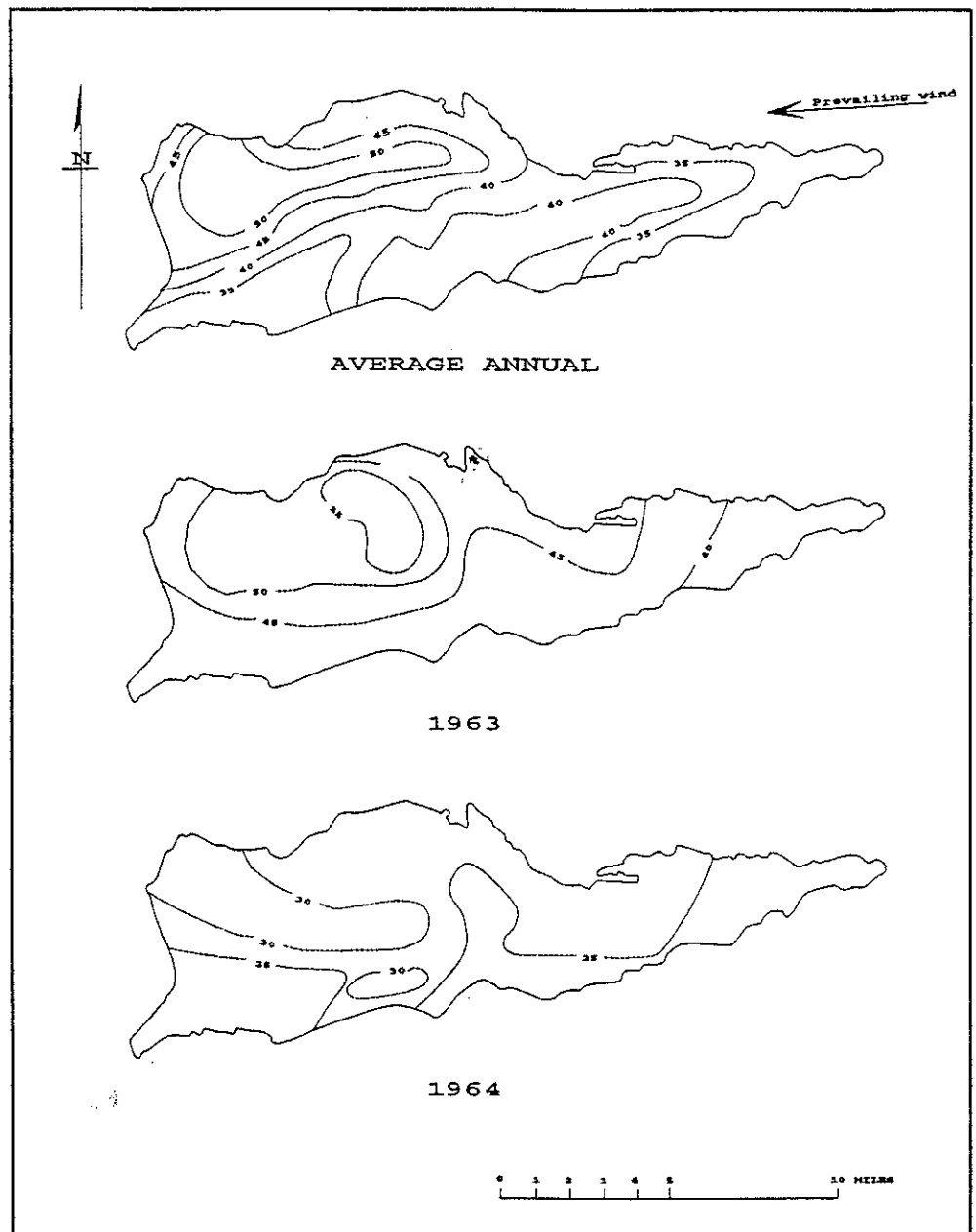


Figure 20 RAINFALL DISTRIBUTION IN INCHES ON ST. CROIX FOR 1963, 1964, AND AVERAGE ANNUAL PRECIPITATION, 1918-1967 (Adapted from Jordan, 1975)

Precipitation

The average annual rainfall on St. Croix is about 40 inches, ranging from 30 inches toward the eastern end of the island to more than 50 inches on the western side. The Salt River site receives approximately 40 inches per year. February and March are the driest months; September is the wettest, with nearly half the annual rainfall occurring from August through November (Jordan, 1975). The rainfall for 1987 (58.88 inches) was considerably higher than the 30-year annual average of 43.75 inches. (Daily News, January, 1988).

LANDFORMS, GEOLOGY AND SOILS

St. Croix is the easternmost possession of the United States and is the largest of the USVI. It is slightly more than 22 miles long from east to west. The western half is rectangular and is approximately 6-miles wide.

The eastern half is 5-miles wide at Christiansted but tapers eastward. The island encompasses about 54,400 acres or 85 square miles.

Geology of the Salt River Basin

The geology of St. Croix consists of two predominant mountainous areas (the northside and east end ranges), separated by a central sediment filled valley. The oldest rocks underlying both ranges date from the Cretaceous period of 80 million years ago. These sedimentary rocks, which were formed from the erosion of volcanic ash and debris, are beset with igneous intrusions.

The Salt River drains a basin of approximately 4 square miles with its headwaters originating in the Northside Range.

Geological investigations indicate that River Gut, Bethlehem Gut, Jolly Hill Gut, Creque Gut, and Salt River had considerably more water flow in the past. They were perennial streams as recently as 40 or 50 years ago (Jordan, 1975).

The highest elevations on St. Croix are found in the northside mountain range with Mount Eagle at 1,165 feet and Blue Mountain at 1,096 feet. The northern slopes toward the sea are steep. Intermittent streams and drainage guts throughout the range allow drainage to the sea. The alluvium fans that fill the mouths of the stream valleys generally extend only a short distance inland from the sea. The Salt River Basin is the largest of such stream valleys on the northern face of this range.

Within the Salt River Basin, there are large areas of alluvium derived from the Mount Eagle Group and the Jealousy formation. The alluvium is composed of silt, clay and thin

discontinuous beds of sand and gravel. There are significant beds of sand and gravel that are capable of producing 10 to 50 gallons per minute (gpm) of groundwater.

Soils

Eleven major soil types are associated with the Salt River Basin. Top soils in this area generally are characterized as a clay loam of varying composition. Soil information is described from the Soil Survey by the Soil Conservation Service (1970). See Appendix M for further information.

FRESHWATER RESOURCES

Salt River is an intermittent stream draining into the head of Sugar Bay. It drains a watershed of approximately 2880 acres and is one of the major "guts" on St. Croix.

As noted earlier, the distribution of rainfall in the area varies widely during the year. It is characterized by long, dry seasons with intermittent periods of high intensity rainstorms. The more intense storms generally result from tropical disturbances that move across the area. These dump large volumes of rainfall over relatively short periods of time.

As a result of the intermittent occurrence of rainfall, most of the stream channels in the study area are normally dry--discharging only during periods of rainfall. The normally dry state of the stream channels belie the runoff that may be conveyed during periods of intense rainfall. This problem is particularly acute due to the extremely steep nature of the upper basin. The steep slopes combined with the soil characteristics yield a short concentration time and relatively high runoff rate. These factors combined with the intense rainfall that occurs yield a flash flood effect in the area. Not only are the flows considerable, but the flow velocity is also high due to the steep slope of the basin.

Flood stages in the area, while dependent on the magnitude and velocity of flow, also greatly reflect the condition of the channel. Previous runoff has established a water course through the area to Salt River Bay. For the most part this water course reflects the topography, soil composition, and high velocities, i.e., it is a fairly well defined channel with rocky bottom and sides. At the lower end of the Salt River, the slope flattens to generate higher backwater with corresponding widening of the floodplain and flooded area.

The Salt River Basin contains three of the groundwater areas of St. Croix: Areas 1b, 1c and 3b (Jordan, 1975, Figure 21). Area 1b is poor because of salt water infiltration. Sea spray and soluble salts that fall on the land from the atmosphere are carried to the groundwater during recharge. However, the Salt River Basin is the most productive of the 1b areas. Wells tapped into volcanic rock in the Judith's Fancy area are yielding 1,000 gallons per day (gpd).

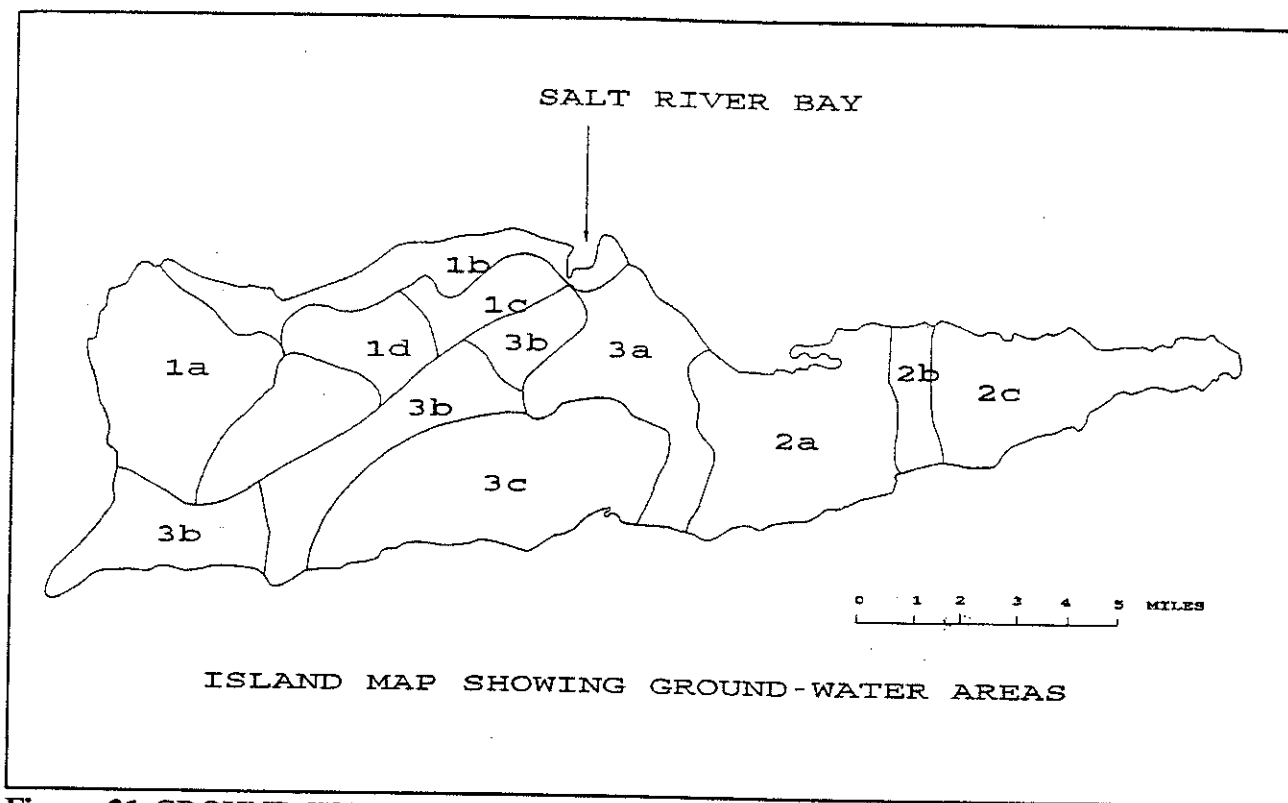


Figure 21 GROUND WATER AREAS FOR ST. CROIX

Area 1c has a much greater potential for groundwater production. Wells in the Salt River valley yield as much as 5,000 gpd at depths of 50 to 300 feet. The amount of yield increases in the lower parts of the valley. The chloride content in the water here is generally less than 150 mg/l. Salt water encroachment is a problem near Salt River Bay.

Area 3b converges on the lower drainage basin of Salt River. Wells in this area may yield from 1,000 to 3,000 gpd. Both the yield and the quality of water from the limestone improve toward the Salt River Bay because of the interchange of water from the alluvium that fills the central part of the valley. At the periphery of the alluvium, wells drilled in limestone yield as much as 10,000 gpd. Wells in the alluvial fill can yield as much as 15,000 gpd. Chloride content within these wells varies from 5,000 mg/l at the base of the aquifer to only 500 mg/l at the center of the valley in the alluvium.

OCEANOGRAPHY

Tides and Currents

The USVI do not have significant tidal ranges or tidal currents. Because of the small size of St. Croix, the sea flows around it with an average change in tidal height of only a few inches. The maximum change is slightly more than 1 foot. Because of the lack of tidal amplitude, only narrow intertidal zones exist along the mostly precipitous slopes of the island. Its tides are primarily diurnal in nature. There is a slight secondary cycle (semi-diurnal), but this is almost indistinguishable because of the slight ebbs and floods. The tides range from 0.8 of a foot to 1.0 foot. Because of the limited tidal range, there are no local tide-driven currents.

The surface currents throughout the Caribbean are driven by the North Equatorial Current which runs west-northwest through the islands and then joins the Gulf Stream. These currents change very little from season to season with the current coming more from the south during the summer months. Surface water from the Atlantic constitutes the predominant water flow through the islands. Currents off the north shore of St. Croix average 0.7 of a knot. The current movement offshore of the Salt River site is usually to the west, although currents running eastward have been experienced. These eastward current movements appear to be caused by shifts in wave and wind patterns to a more northerly direction. Most of the inshore sediment transport on the north shore of the island is from wave action. Current speeds have been measured in coordination with the undersea habitat operated by NOAA in the submarine canyon. These currents are generally less than 20 cm/sec, and the strongest down-canyon currents are in the neighborhood of 50 cm/sec.

The Salt River estuary consists of Salt River Bay together with Triton Bay, a southeastern arm of the bay, and Sugar Bay, the southwestern arm. Salt River drains into Sugar Bay, and then into Salt River Bay. The estuary is a drowned river valley that has become restricted by the growth of coral on the east and west sides of the mouth of the bay. This barrier reef abates oncoming waves and limits tidal action. Since the tidal action is limited, circulation in the inner reaches of the bay is quite poor.

During the preparation of the Environmental Assessment Report for the proposed Virgin Grand St. Croix development project, currents within the bay area were measured in February 1986. Results of the monitoring activity illustrated the generalized flow patterns in the bay as well as a wind-driven cell in the outer bay.

Waves

The deep water waves off St. Croix are driven primarily by the northeast trade winds which blow most of the year. Waves average between 1 and 3 feet 42 percent of the time during

the year (IRF, 1977). The prevailing waves approach Salt River Bay from the east-northeast. On the north shore of St. Croix, waves tend to erode headlands and deposit sand in the bays.

Seas are generally much calmer during the summer months, but waves reach 6 feet during winter months. The winter high swales produced by storms in the north Atlantic frequently cause a high degree of turbidity offshore. Turbidity within the Salt River submarine canyon is often a combination of wave action and upland runoff.

The marine shoreline is subject to erosion by waves as seen in the undercutting of the beach rock and exposed tree roots along the open shorelines. In a few areas, the coral reefs offshore serve to dissipate the wave energy reaching the shoreline. The Salt River estuary is protected by a coral reef extending across most of its mouth. The incoming waves and swales are refracted around the headland at Judith's Fancy and Whitehorse Reef as they approach from the east-northeast. Waves do form within the bay itself because of periods of sustained winds. The waves are typically less than a foot in height.

The probability of a hurricane is once in 16 years. Major tidal flooding occurs on an average of once in 33 years (Bowden, 1974). Hurricanes potentially could create waves on the north shore in excess of 20 feet. (Bretschneider 1979, U.S. Army, 1977).

During the passage of storms, wave conditions can worsen considerably. During a 2-week period in 1978, winds blew in excess of 30 knots, creating 15-foot waves. (Hubbard et al, 1981).

St. Croix lies in one of the most earthquake prone places in the world and is susceptible to ground shaking, earthquake induced ground failures, surface fault ruptures and tsunamis (tidal waves) (Hays, 1984). The year 1987 marked the 125th anniversary of St. Croix's last major earthquake. The possibility of St. Croix having a major quake in the next 20 years is approximately 50 percent (Earthquake Engineering Seminar, Nov. 6, 1987).

Marine Water Quality

The marine water quality has been monitored on an intermittent basis by the Division of Ambient Monitoring, USVI Department of Planning and Natural Resources since 1979. Numerous monitoring stations lie within the Salt River Bay.

The water quality in the area varies greatly depending on sea and weather conditions. Salinity, suspended solids and turbidity are all a function of upland runoff. Turbidity and suspended solids also are a function of resuspension by wave activity in the bay.

Because of the heavy loads of nutrients that reach Salt River Bay from the large watershed, large populations of plankton persist.

Because of the large amount of bacterial and algal activity, anoxic conditions may exist in the bottom waters in the inner bay where water depths exceed 15 feet (Gerhard and Bowman, 1975).

Large amounts of runoff which, at times, reach the bay, poor flushing, and circulation all contribute to the water quality of the bay. This water quality has also been affected negatively by the repeated dredging of channels within the bay. The deepening of channels in the bay has created areas below the photic zone which are devoid of plant life. Plant life, seagrass and algae serve as filters helping to settle some of the suspended solids in the water column.

Water quality also has been impacted by the presence of boats which introduce toxic bottom paints into the environment. Antifouling paints are used to prevent organisms from growing on the bottoms of boats. The chemicals from these paints slowly leach out and affect the marine community.

Boats, especially live-aboards, affect the environment by often introducing raw sewage. Even though law prohibits the release of sewage, it can be expected to happen in the bay.

BIOLOGICAL RESOURCES

The Salt River area has been the subject of much uncoordinated study over the recent past. Data have been collected by researchers working at the NOAA Hydrolab, scientists at the West Indies Laboratory of Fairleigh Dickinson University, independent consultants surveying the area for developers and landowners, and others conducting public and private studies of the flora and fauna. A qualitative description of the entire area of Salt River will be presented and will be based on the contents of these previous studies, as well as on all other published and unpublished information available.

Marine Resources

The Salt River estuary and submarine canyon are two extremely important marine resources. Both play an important habitat role for the island's fish and marine invertebrates, especially those of significant commercial value. The submarine canyon, a unique geological feature of the sea floor, plays a key role in sediment transport. The estuary is the last remaining relatively undisturbed vestige of a true estuarine system in the USVI. Although Christiansted harbor to the east of Salt River Bay and Krause Lagoon on the south shore of St. Croix once played similar roles, humans--in the name of progress--have destroyed their function as such.

The Salt River submarine canyon is an unusual marine geological feature. The canyon begins in 15 feet of water at the barrier reef and continues seaward to a depth of 270 feet where it plunges to abyssal depths (over 12,000 feet). The east and west walls of the canyon are dramatically different. The west wall is steep, often vertical, with caves and overhangs. Great cuts and grooves in this wall serve as areas for sediment transport into the canyon. The eastern wall is not as steep and is a cobble wall closer to the shore. In this area sediment transport is toward the west. This continual transport of sand into the canyon from the east inhibits coral growth in that area. The dominant cover on both canyon walls is scleractinian coral (hard corals) and crustose coralline algae.

The upper edges of the canyon wall (the shelf) range from between 30 feet to 50 feet in depth. Along the edges of the canyon and across the shelf are scattered elkhorn coral (*Acropora palmata*), brain coral (*Diploria* spp.), fire coral (*Millepora* spp.), boulder coral (*Montastrea annularis*) and some staghorn coral (*Acropora cervicornis*). On the walls of the canyon, the lettuce leaf coral (*Agaricia* spp.) is much more predominant. Sponges and soft corals are present both on the canyon walls and on the shelf. The floor of the canyon contains seagrass and seaweed beds which serve as feeding grounds for many invertebrates.

Salt River Bay is partially protected from the open sea by a bay-barrier reef. This reef is primarily composed of finger coral (*Porites* spp.) and elkhorn coral. Much of this coral is dead and has become overgrown with encrusting corals, sponges and algae. The bay-barrier reef abates oncoming waves and acts to slow downtidal exchange. It is the presence of this reef that makes Salt River Bay such a good "hurricane hole" for boaters.

The Salt River estuary consists of Salt River Bay, Triton Bay and Sugar Bay. Salt River drains approximately 3,000 acres of watershed and flows into Sugar Bay, thence into Salt River Bay. The estuary is a drowned river valley which has become restricted by the growth of coral on either side of the mouth of the bay. The circulation within the inner reaches of the bays is very poor except during heavy rainfall when freshwater runoff provides a flushing action.

The estuary is partially surrounded by mangroves. Sugar Bay (the western bay) supports a gallery forest of red mangroves (*Rhizophora mangle*). Prop roots from these trees create a protective habitat for juvenile fish and invertebrates. Triton Bay is also partially surrounded by mangroves. Salt River Bay has stands of red mangrove growing on its western fringe where there has been little alteration by man in the recent past. The eastern shore of Salt River Bay has been extensively altered for commercial development with both dredging and filling activities. Here, juvenile mangroves have recolonized much of the altered shoreline. Mangroves are found along the man-made finger channel within the marina basin and along some of the reclaimed land. The floor of the estuary varies from being barren, the result of sedimentation and previous dredging, to supporting lush grass and algae beds.

Man has altered the area to some degree over the years, mostly within the last century. Numerous channels have been cut to allow for boat access into the headwaters of the bay. Salt River Marina lies on the western edge of the bay. The marina basin and entrance channel, dredged more than 20 years ago, are still devoid of life. The ruins of attempted development lie on the eastern shore of the bay. The NOAA undersea habitat station is situated on the western shore of Triton Bay. Faile Channel, dredged many years ago, leads to the station. The channel floor here is also devoid of life.

Boats still impact the area by anchoring in the shallow grass beds where anchor damage is very evident. The entrance to Salt River Bay is fairly shallow and difficult to navigate. This fact has contributed in keeping it from becoming overrun with moored boats.

Salt River Bay

Salt River Bay, including Triton and Sugar Bays, is the largest and most significant relatively undisturbed estuary remaining on St. Croix. This estuary represents a first-order interface between land and sea. It integrates terrestrial, freshwater and marine systems in a highly significant and complex web. An estuary is defined as a semi-enclosed coastal body of water which has a free connection with the open sea into which fresh water is introduced through upland drainage. Estuaries trap significant quantities of material, thus acting as filters between the land and sea. The size and mixing potential of an estuary determine the ability of the estuary to remove and retain suspended materials. The filtering by the estuary is both physical and biological. Physically, geological shape and geochemical processes including precipitation, flocculation and sorption play a part in the removal of dissolved and suspended matter. Estuary shape and circulation patterns control the location and concentration of the most turbid areas within an estuary.

Biological and biochemical filtration in estuaries occur in several ways: filter feeding by plankton and benthic organisms; biological fixation of dissolved materials into particulate form (followed by removal by filter feeding or sedimentation); and sedimentation caused by the baffling effect of mangroves, seagrasses and algae on water movement. These submerged macrophytes play a key role in filtration by increasing removal and decreasing resuspension of fine-grained particulates.

All of these systems occur in the Salt River Bay estuary. The filtering role played by the wetland elements is extremely vital to the health of the entire ecosystem. In addition, estuaries are critically important habitats for marine organisms, especially for juvenile and larval stages. Salt River was once one of many such systems on St. Croix. At one time, Christiansted and, much more recently, Krause Lagoon were also major recruitment areas for juvenile organisms. Both of these systems have been

irreversibly damaged through development by man. Now only Salt River remains as a functioning large estuarine ecosystem.

Many of the important commercial and noncommercial fish and invertebrates rely on the estuary system for their survival: queen conch (Strombus gigas), West Indian lobster (Panulirus argus), white mullet (Mugil curema), dwarf herring (Jenkinsia lamprotaenia), snook (Centropomus undecimalis), bonefish (Albula vulpes) and numerous species of snapper (Lutjanus spp.).

Triton Bay

The NOAA Hydrolab facility lies on the western edge of Triton Bay. A channel was dredged during the 1960s to access this area. The channel, known as the Faile Channel, extends from Salt River Bay back to the Hydrolab Base bulkhead. The bottom of the dredged channel is primarily devoid of life with only a few scattered algae. Mostly clumps of drift algae are found. In this dredged area, the bottom is covered by fine particulate material which is resuspended easily into the water column. Along the edges of the dredged area and in shallower areas, Caulerpa, Acanthophora, Penicillus, Udotea, Halimeda, Hypnea, Laurencia and Gracilaria are present. In the undisturbed areas, moderate to dense grass and algal beds prevail. Thalassia testudinum and Syringodium filiforme are the most abundant grasses in the bay. Some scattered small amounts of Halodule are also present. Algae associated with the seagrass and found in large patches on the fringe of the grass beds include Halimeda incrassata, H. discoidea, Penicillus capitatus, P. pyriformis, Avrainvillea longicaulis, Udotea flabellum, Rhipocephalus oblungus, Padina sanctae-crucis, Laurencia triquetrum, Caulerpa racemosa, C. sertularioides, C. proflera, Valonia ventricosa, Dictyosphaeria cavernosa, Laigora valida, Neomeris annulata, and Gracilaria spp., as well as blue-green crustose coralline and articulated coralline algae.

Large numbers of invertebrates live in this seagrass-algal zone, including Smaragdia viridis, Lucina spp., Bulla straita, Turbo spp., Nassarius spp., Cerithium litteratum, Olivella spp., Callianassa, various pelecypods, polychaete worms, pencil urchins (Eucidaris spp.), the white snowball urchin (Tripneustes ventricosus), blue crabs (Callinectes spp.), barber pole shrimp (Stenopus spp.), and a variety of sea anemones (Condylactis gigantea, Bartholomea annulata and Stoichactis helianthus).

Much of the area is surrounded by red mangrove. The prop roots of these trees serve as substrate to a variety of marine organisms. Attached to the mangrove roots are numerous algae and filter feeding mollusks, sponges and tunicates. Sponges and various algae, including Acetabularia, Batophora, Dasya, Cladophora, Chaetomorpha, Acanthophora, Gracilaria, Ceramium and Caulerpa are the dominant organisms found

on the roots throughout the bay. Mangrove oysters (Isognomon and Crassostrea rhizophora) are abundant on many of the mangroves. The distribution of organisms on the roots of the mangroves seems to follow no pattern. One root will be covered with a community extending out from the root to over a foot in diameter, while the very next prop root will have little more than algal fuzz. There is a zonation of growth from the tops to the bottoms of the roots, but the patterns are not consistent enough from root to root to warrant a zonation description which would encompass the entirety of the mangrove population in the bay. Approximately 70 percent of the mangrove roots around the bay support large epiphytic (living on the surface of plants) communities.

Sponges seen on the mangrove roots include fire sponge (Tedania ignis), Ircinia strobilina, chicken liver sponge (Chondrilla nucula), red finger sponge (Haliclona rebens), variable sponge (Anthosigmella varians), and black chimney sponge (Pellina carbonaria).

Mangrove oysters are found in numbers from less than 10 to more than 200 per prop root. Other invertebrates found are the mollusks: Batillaria minima, Neretida virginea, Littorina angulifera, Arca and Melampus. Tunicates also are present on these roots including Ecteinascidia, Clavelina, Ascidia and Microcosmus. Anemones and tube worms occur with some frequency on the roots including Aipitasia, Sabillastarte and Sabella. Ascidians, cirripeds, shrimp, bryozoans and brittle stars also are present on the roots.

Sugar Bay

The western arm of the Salt River estuary, Sugar Bay, contains one of the largest stands of red mangrove on St. Croix. This gallery forest is located at the southern tip of the bay and slowly evolves into a freshwater wetland area upstream of the mangroves. The North Shore Road runs close to the bay on its western edge and the mangrove community there is very thin. The eastern side contains an array of tidal lands and salt ponds where the mangrove community is dense and thick. As in Triton Bay, red mangroves surround the waters' edge within the bay, and their roots are teeming with life. The bottom of the bay is covered in fine silt and the bay is quite turbid.

During surveys made for Coastal Zone Management (CZM) environmental assessment reports, very little fauna or flora was found attached to the bottom in the upper reaches of the bay because of turbidity. Along the edges of the bay and in shallower, clearer areas, seagrass and algal beds are found. Their abundance is highly dependent on light transmission through the water column.

During the survey on both Triton and Sugar Bays, mullet, bonefish and barracuda (Sphyraena barracuda) frequently were seen jumping out of the water. It is not uncommon to see southern stringrays (Dasyatis americana) break the surface as well. Hawksbill (Eretmochelys imbricata), leatherback (Dermochelys coriacea) and green sea turtles (Chelonia mydas) have been seen by local fishermen and by others in the bays.

Man-Induced Changes in Salt River Bay

Salt River Bay has been impacted by humans over the years. These impacts are both indirect, through siltation and sedimentation because of development in the upland area and other changes in the watershed, and direct, through dredging, filling and other land form changes. The direct changes are immediately evident, but the indirect impacts are more difficult to assess.

The eastern half of the bay has been altered extensively. Marinas and channels have been dredged and land has been created through filling. The original shoreline as a consequence has been altered drastically. A failed development attempt left a crescent-shaped bay, a 10-foot deep marina, a finger channel, peninsulas and a ruin which resembles a modern church. Mangrove forests were destroyed in this alteration and only now, some 20 years later, are they beginning to become reestablished. Black (A. germinans), white (L. racemosa) and red mangroves line the finger channel and the marina basin. These trees are young and somewhat stunted, but they are successfully recolonizing the area. The bottom communities in the dredged areas are not.

The western side of the bay has been altered to some degree as well. Salt River Marina presently exists on this western shore. The marina has been bulkheaded and dredged. An island of red mangroves now stands in the center of the marina basin. Water quality and visibility within the marina are poor.

The bottom of Salt River Bay varies from algal cover, sandy bottom, grassbeds, to mucky bottom. The center portion of the bay has a mucky bottom because of past dredgings and continued input of sediment through runoff. Seagrasses (Thalassia testudinum, Syringodium filiforme), and sparse amounts of Halodule wrightii lie in patches in front of the peninsula (Dyck Estate), and across the northern half of Salt River Bay. Algal species found throughout this area include Hallimeda, Dictyota, Caulerpa spp., Penicillus, Acanathophora and Udotea.

The crescent-shaped bay on the eastern side of Salt River Bay is partially colonized by seagrasses and algae. The southern rock jetty which protrudes into and partially protects the bay was the site of a field study on juvenile West Indian lobsters by

David Marshack. Marshack (pers. comm.) demonstrated that a large population of juvenile lobsters has been induced to inhabit the bay area by introducing additional habitat space which lobsters occupied within a 2-week period.

Open mangrove lagoons are known to be habitat and nursery areas for many species of commercially valuable fish and invertebrates. The Salt River Bay system is one where high nutrients form the base of the detrital food chain which, in turn, stocks the reefs and bays with fish and invertebrates. If this system is damaged further through man-made alterations, populations of many species, both commercial and noncommercial, will be severely diminished.

Offshore Environment

The area offshore of Salt River Bay is typical of other areas along the northwest shore of St. Croix. There is a relatively shallow pavement shelf leading out to a deep forereef on the crest of the drop-off wall. The drop-off is gradual and quite deep (50 to 70 feet). The forereef is very wide and healthy throughout the area. The Salt River submarine canyon, as previously described, is the most prominent feature of the offshore environment. A shallow bay-barrier reef extends from near shore on both sides of the bay mouth.

The floor of the submarine canyon has been the study site for many Hydrolab experiments involving seagrass and seaweeds. The seagrasses Thalassia and Syringodium as well as the algal species Halophila, Halimeda and others found in the bay and on the shelf edge are found also in patchy abundance on the canyon floor. The amounts of plant coverage decrease with depth as light transmission through the water column decreases.

The canyon walls are colonized by hard coral. The western wall is more vertical with coral throughout while the eastern wall has a large slumped area at its shallower end. Between 5 and 24 percent of the coral on the west wall is live. Coral species were the same on both walls, with Agaricia spp. and Montastrea spp. being the most abundant. The following species have been recorded during Hydrolab missions: Stephanocoenia michelinii, Madracis decactis, Acropora cervicornis, Agarcia agaricities, A. lamarcki, A. fragilis, Helioseris cucullata, Siderastrea siderea, Porites astreoides, P. porites, Diploria labyrinthiformis, D. strigosa, Colpophyllia natans, C. breviserialis, Montastraea annularis, M. cavernosa, Meandrina meandrites, Dichocoenia stokesi, Mussa angulosa, Scolymia sp., Isophyllia sinuosa, Mycetophyllia ferox, M. aliciae, Eusmilia fastigiata, and Millepora spp. The shoreline is rocky along the eastern side of the Salt River Bay mouth. The remainder is a mixture of sand and cobbles. A wrecked barge lies rusting in the shallow water off the Cape of the Arrows. Along the western side of the bay mouth there is beachrock which is partially submerged.

Rocks from the Judith's Fancy formation extend submerged into the sea along the eastern shore of the bay mouth. The shoreline is a high energy area, exposed to the impact of oncoming waves. The beach is scattered with coral rubble, seaweed and algae.

Turbinaria and Sargassum are predominant in high energy wave-swept areas. Padina is found in more protected tidal pools. Other algae seen in the intertidal zone are Valonia, Ernodesmis, Dictyota, Cladophora, Gracilaria, Gigartina, and numerous filamentous browns and crustose reds. Small corals occur farther out on the high energy shelf. Corals seen include star coral (Porites astreoides), and finger coral (P. porites). There is abundant fire coral (Millepora alcicornis and M. complanata). Invertebrates seen in the area include the abundant boring urchin (Echinometra lucunter), the fairly common snow ball urchin (Tripneustes), hermit crabs (Dardanus), sally-light-foot crab (Grapsus), keyhole limpet (Fissurella), top shells (Cittarium), and Nerita.

In the offshore areas on either side of the canyon there are various bottom community zones: (1) nearshore algal areas, (2) pavement zone, and (3) the forereef and drop-off wall. The division between these zones is not abrupt, but rather is given here for simplicity of description.

Nearshore Algal Areas

The algal species noted below were seen during surveys of the site at the time the field work was done for this report or previously described in other reports on the area. Penicillus capitata, Avrainvillea longicaulis, Udotea flabellum, Udotea conglutinata, Rhipiocephalus oblongus, articulated coralline algae, Padina sanctaerucis, Laurencia papillosa, Hypnea musciformis, Cladophora spp., Bryothamnion triquetrum, Halimeda discoidea, Caulerpa racemosa, C. sertularioides, Valonia ventricosa, Dictyosphaeria cavernosa, Neomeris annulata, and various filamentous green, red, brown and blue-green algae all were present. The algal populations are most dense on the shallow beach rock shelf located west of the bay mouth. Bottom coverage ranges between 30 percent and 50 percent.

The nearshore algal area begins at the low water mark and continues seaward to a water depth of 5 feet. This zone varies from 15 feet to 100 feet in width. Proceeding seaward, the algal abundance does not diminish, but other organisms become more prominent. Algae in many cases is more abundant in the pavement zone than in the nearshore algal zone.

Animals seen within the algal zone include: irregular sea urchins (Echinometra lucunter), brittle stars (Ophioderma spp.), octopus (Octopus hummelincki), fireworms (Hermodice carunculata), fairy basslets (Gramma loreto), redlip blennies

(Ophioblennius atlanticus), and gobies (Gobiosoma spp., Gnatholepis spp. and Coryphopterus spp.).

Pavement Zone

An expansive flat pavement zone covers a majority of the nearshore shelf before the drop-off wall. The pavement area is covered lightly with sand and detrital material. Between approximately 45 and 50 feet from shore, the water depth increases and various algae, especially Dictyota spp. and articulated coralline algae, dominate the area. Scattered hard corals, a few soft corals and sponges also occur throughout this area including healthy isolated stands of elkhorn coral, a few staghorn coral, brain coral (Diploria labyrinthiformes, D. strigosa, D. clivosa and Colpophyllia natans), fire coral (Millepora alcicornis, M. squarrosa and M. complanata), Montastrea annularis, starcoral (Porites astreoides), finger coral (Porites porites) and sponges (Adocia caronaria, Haliclona rubens, Agelas schmidtii, A. scriptrum, Haliclona hogarthi, Clonia spp. and Verongia longissima). Soft corals such as sea fans (Gorgonia ventalina and G. flabellum) and other gorgonians (Pterogorgia spp., Eunicea spp., Plexura spp. and Muricea spp.) are found within the pavement zone. Black spiny sea urchins (Diadema antillarum), West Indian lobsters (Panulirus argus), featherduster worms (Sabillastarte magnifica), spaghetti worms (Eupolymnia nebulosa) and sea anemones (Condylactis gigantea and Bartholomea annulata) are included in the many reef organisms living among the coral patches.

The abundance of corals increases with increased depth, slowly grading into the inner forereef and the drop-off wall. Within the pavement zone, densities are sporadic with large areas having minimal coral growth. The entire pavement area is littered with dead coral. Dead elkhorns form eerie silhouettes with piles of coral rubble forming a protective habitat for the teeming fish populations.

Forereef and Drop-Off Wall

The coral reef community of the forereef is well developed and is dominated by Montastrea annularis, M. cavernosa, and Agaricia agaricites. All of the hard and soft corals noted in the pavement zone and on the walls of the canyon also are present on the drop-off wall. The outer forereef occurs all along the edge of the sloping shelf and consists predominantly of buttresses of Montastrea and shingled layers of Agaricia agaricites. These buttresses are separated by fingers of loose sand chutes with steep slopes of 20 to 35 degrees. At depths these chutes eventually are replaced by an open sand and rock bottom with a few A. agaricites and black coral (Stichopathes) with sclerosponges (Ceratopoporella nicholsoni) beginning at the edge of the vertical wall about 180 feet down.

Fish

The Salt River estuary is one the most important nursery grounds on the island of St. Croix. Both commercial and noncommercial reef species depend on the mangrove systems as juveniles. Without the healthy estuary, recruitment onto the reef would drastically diminish, the commercial fisheries would fail, corals would become overgrown with algae because of the loss of grazers, and the entire ecosystem would change. Fish seen during visits to the Salt River area are listed in Appendix H.

TERRESTRIAL RESOURCES

The Salt River is a continuum of natural habitats strung together in a chain of interrelated parts. The fresh waters that flow off the forested hillsides into the Sugar Bay finger of Salt River Bay contribute to the largest intact wetland system in the U.S. Virgin Islands. The mangrove system filters and cleanses the waters that flow into the Salt River estuary. These waters reach the bay cleaner and full of the nutrients required to support the ecologically important seagrass and coral habitat which are the basis of the fisheries. This area is habitat to most of the 28 threatened or endangered species reported for Salt River.

The Sugar Bay mangroves form a gallery forest of black (Avicennia germinans), white (Laguncularia racemosa) and red (Rhizophora mangle) mangroves and buttonwoods (Conocarpus erectus). Salt ponds lie trapped behind the first line of mangroves on the bay arms. These areas form protective habitats for highly diverse invertebrate and avian populations. The western backwaters of Salt River are considered the best examples of mangroves in the Virgin Islands by Gilberto Cintron of the Department of Natural Resources of Puerto Rico, a renowned mangrove specialist.

Many rare and threatened plants and animals are found throughout the area. The swamp fern (Acrostichum danaeifolium) and the stingbush (Malpighia infestissima) are found within the Salt River forests. Two subspecies of butterfly, endemic to the Virgin Islands, are known to occur in the Salt River area, a Cassius Blue (Leptotes cassius catalina) and a Polydamas Swallowtail (Battus polydamas thymus). The swallowtail is the second largest butterfly in the territory.

Fauna

The dense mangrove forest and unique geological and topographical features of Salt River make it one of the most diverse and abundant habitats on St. Croix. The importance of this area has not been overlooked. It has been listed as an "Area of Particular Concern" and an "Area for Preservation and Restoration" and a "Significant Natural Area" by the Virgin Islands Coastal Zone Management program. It also was designated a National Natural Landmark in 1980 by the U.S. Department of the Interior.

The Salt River area has been the subject of many uncoordinated studies such as Environmental Assessment Reports, Preliminary Assessment Reports, and studies of avian populations. All of the available information plus additional field studies were used to provide a complete picture of the fauna of Salt River. The area was surveyed using an off-road vehicle (ORV) in the pastures and by walking through areas not accessible by vehicle. All fauna were recorded together with their signs. A complete list of resident and transient fauna found at the site is provided in Appendix F. This Appendix lists those animals seen on the site as well as those that are likely to occur.

Mammals

The largest mammals seen on or from the site were humpback whales (Megaptera novaengliae) seen on February 17, 1989. Mongoose (Herpestes auropunctatus) were seen frequently throughout the entire site. Mongoose were seen in highest abundance after weekends, feeding on litter left from camping along the shore front on the western side of the bay mouth. The site also is being used by the white-tailed deer (Odocoileus virginianus). Bucks and does have been seen in the road at night along the mangroves on the western side of the bay. Bats and mice also are present and were seen but not identified as to species.

Birds

The Salt River area is one of the most important habitats on St. Croix for both migrating and resident birds. The area provides cover and a large productive feeding ground. The Black-crowned Night-heron (Nycticorax nycticorax), Great Egret (Casmerodius albus) and Snowy Egret (Egretta thula) are all locally threatened species found within this area. Endangered Brown Pelicans (Pelicanus occidentalis) frequently are seen feeding both within the bay and out in the open sea.

The use of the pond by various species changes with seasons as well as with the changing conditions of the estuary; therefore, over a period of study covering only a few months, it is impossible to see all the many species which typically use the area. NPS Resource Manager Ro Wauer and Consultant Fred Sladen conducted a survey of this area in 1986 and 1987 to determine the importance of this habitat to overwintering North American migratory bird species. Individuals seen ranged from 39 to 161 in a 2-hour period. Thirty-five species of land birds were recorded in the area, of which 15 can be considered full-time residents. Three species use the Sugar Bay mangroves as summer residents only and 17 use the mangroves only during migration and/or in the winter months. The area is an essential habitat for songbirds during the winter months. They spend more time over winter here than they do migrating or in their North American breeding grounds. A total of 110 species of birds has been recorded in the Salt River area. Of the 44 species of birds currently known to breed

on St. Croix, 26 nest at Salt River. Appendix G indicates the results of the Sladen/Wauer study within the Sugar Bay mangroves.

Twenty-four species of locally or federally listed threatened or endangered birds have been reported within the Salt River system. Species that currently or once nested there include Great Egret, Snowy Egret, White-cheeked Pintail (Anas bahamensis), West Indian Whistling Duck (Dendrocygna arborea), Caribbean Coot (Fulica caribaea), Least Tern (Sterna antillarum), and White-crowned Pigeon (Columba leucocephala). Species that use the area for feeding and roosting include Brown Pelican, Great Blue Heron (Ardea herodias), Tricolored Heron (Egretta tricolor), Black-crowned Night-heron, Peregrine Falcon (Falco peregrinus), Willet (Catoptrophorus semipalmatus), Roseate Tern (Sterna dougalii), and Bridled Quail-dove (Geotrygon mystacea).

Birds also occur in nonmangrove areas. Frigate Birds (Fregata magnificens) and Ospreys (Pandion haliaetus), usually are seen soaring around the shoreline and feeding in the open bay. A large variety of shorebirds occur on the narrow beach and shore front.

In the upland areas, doves (Columbina passerina and Zenaida aurita) and pigeons (Columba squamosa) occur, as do Grey Kingbirds (Tyrannus dominicensis), Red-tailed Hawks (Buteo jamaicensis), Peregrine Falcons, Ospreys, Smooth-billed Anis (Crotophaga ani), Pearly-eyed Thrashers (Margarops fuscatus), Yellow Warblers (Dendroica petchia), Bananaquits (Coereba flaveola) and hummingbirds (Eulampis holosericeus).

Reptiles

Anole lizards (Anolis acutus) are abundant in the area as they are over most of St. Croix. The dwarf gecko (Sphaerodactylus macrolepis) was seen in all areas where there was abundant semi-dry leaf litter. Woodslaves (Hemidactylus mabouia) and (Thecadactylus rapicauda) most likely are present, but none were seen during the course of the study.

The beach areas to the east and west of the bay mouth are known nesting sites for hawksbill (Eretmochelys imbricata) and green sea turtles (C. mydas). These two species, plus the leatherback turtles (Dermochelys coriacea), have been reported feeding in the canyon and in the bays, mostly among the coral reefs and seagrass beds. All three sea turtles are listed on the Federal Endangered Species List.

Amphibians

Large marine toads (Bufo marinus) were prevalent, especially after heavy rains when fresh water collected along the roadways. For a complete list of possible residents, see Appendix F.

Invertebrates

Land crabs (Cardisoma guanhumi) are abundant all around the bay and are much sought after by fishermen and crabbers. Ghost crabs (Ocypode spp.) are abundant on the beach, and fiddler crabs (Uca pugnax rapax) are abundant around the salt ponds and dense mangroves. Literally hundreds of fiddler crab holes cover the edges of the salt ponds and floor of the mangrove forest. Rock crabs (Grapsus grapsus) were found on the roots of the mangroves surrounding the bay. Soldier crabs (Coenobita clypeatus) are found in great abundance in the littoral forest surrounding the shoreline.

Flora

The Salt River Bay area consists of floodplains, knolls, and extensive mangrove forests. Some of the present surrounding property is under agricultural use while other areas are residential or commercial.

The area is a mix of habitat types in various conditions. There are undisturbed dry forests, mangrove galleries and freshwater wetlands. Adjacent to these are habitats in various states of recolonization: wetland species reestablishing on filled land, dry forest regaining footholds, and mangrove forests forming around man-made ponds. The area contains a high diversity of habitat types and is replete with examples of vegetative succession, demonstrating nature's ability to recover from the adverse impacts of humans. The area is currently under the threat of development. Both direct impacts from physical disturbance and destruction of sites and indirect impacts from disturbances in the watershed threaten Salt River. Nature is resilient and ecosystems normally recover from natural episodes of stress. Terrestrial and marine species, many of them threatened or endangered, depend on the survival of these systems. If the ability of these systems to function is diminished further, drastic changes will occur to both marine and terrestrial fauna and flora.

Comments on the vegetation begin with the western side of the bay at the Columbus Landing Site and circle the bay in a counter-clockwise direction to the east, ending with Cape of the Arrows at Judith's Fancy.

Flora--Columbus Landing Site

This was once the site of pre-Columbian Carib habitation and later the location of European fortifications. It is now a historical park and a popular public beach. A sandy beach runs westward from the point with some interruption of beach rock around to the Gentle Winds Condominiums. The area where the fort stands is overgrown with scrub vegetation such as tan-tan (Leucaena leucacephala), white manjack (Cordia alba), crotons (Croton spp.) and sages (Lantana spp.). To the west along the shore manchineel (Hippomane mancinella), seagrapes (Cocoloba uvifera) and haiti-haiti (Thespesia populnea) dominate the shore front vegetation. Ground covers in the area include baybean (Canavalia maritima), nickerbean (Caesalpinia crista), sea rocket (Cakile lanceolata), beach morning glory (Ipomoea pes-capre), sandburr (Cenchrus echinatus), salt grass (Spartina patens), beach grass (Distichlis spicata), and sea purslane (Sesuvium portulacastrum).

To the south along the western side of Salt River Bay, the majority of the shore front is lined with red mangrove, black mangrove and a few Jacquinia. Immediately behind these trees are buttonwood and white mangrove. Some of the area immediately behind the mangrove has been cleared for vehicular access and still is being used for dumping of trash. Most of this area is presently overgrown with tan-tan and casha (Acacia tortuosa) and a very few white manjacks.

In the area where the bay dips in toward the road, the thicketed area is wide. Manchineels, buttonwoods, and fish poison trees (Piscidia piscipula) are found behind the mangrove. Along the road, as along most roads, because of continual clearing, tan-tan and other secondary plants, including the territorial flower, ginger thomas (Tecoma stans), are abundant as is guinea grass (Panicum maximum). Along this area on the shoreline there are a few locally endangered stingbushes (Malphigia infestissima). This tree with its glass-like spine on the underside of its leaves is found only on the north shore of St. Croix and on Buck Island. The red and black mangroves continue inland on the coastline and into the marine area. This area has been altered by humans and is now the site of the Salt River Marina. Immediately to the north of the marina, an area has been cleared recently between the road and the mangroves and now only coconut palms (Cocos nucifera) remain.

The marina developer has left many red mangroves that form an island in the center of the marina basin. The marina site was cleared and now has ornamental-type plants. To the south of the marina, the mangroves begin again and continue to the south. Small patches of mangroves have been cleared by fishermen to allow boat launching. In many areas, the road immediately abuts the mangroves. Where there is some distance between the road and the mangroves, the space is taken by dominant species such as haiti-haiti, manchineel, white manjack, ginger thomas, gre-gre (Bucida

buceras), red manjack (Cordia collococca), turpentine (Bursera simaruba), caper (Capparis flexuosa), and (C. cynophallophora), casha, croton, sweetlime (Triphasia trifolia) and varieties of eugenia (Eugenia spp.).

The bay continues southward leading into the Sugar Bay mangrove stand and floodplain.

Flora--Sugar Bay

The property south of the mangrove line has been used for livestock feed production during the past few years. Much of the property is overgrown with wild grasses and shrubs, in part, because of poor soil conditions. In a 1973 aerial photo of the area, much of the property that is now cleared appeared to be covered with trees. A foundation of a house on the western side of the property abuts the mangrove line. At one time, part of the mangrove area was cleared for the operation of a tropical fish farm. This has been abandoned for at least 15 or 20 years and large black mangroves, some more than 50 feet in height, have recolonized the area. A raised roadway was placed through the center of the mangroves to a point about 30 feet east of the southern tip of the open water of Sugar Bay. This road is about 2 to 3 feet above sea level and thus has not been recolonized by mangroves. Some dry scrub vegetation has started to colonize the road because of the lack of usage. The steep hillsides do not appear to have been altered in the recent past.

The upland areas of the Sugar Bay drainage basin consist of steep hills covered with a dry forest vegetation. The dominant species include white manjack, limber caper (Capparis flexuosa), Jamaican caper (Capparis cynophallophora), tan-tan, casha, stink casha (Acacia macracantha), ginger thomas and black mampoo (Torrubia fragrans). Also found in this thick vegetation are mahogany, spiceberry eugenia (Eugenia rhombea), and a preponderance of other dry forest trees (listed in plant list Appendix I). The soils here are rocky and show evidence of previous erosion.

Part of the Sugar Bay floodplain has been cleared by an adjacent property owner and farmer. Much of it, however, is overgrown with grasses, tan-tan, casha, papaya (Carica papaya) and a variety of other opportunistic plant species. Part of it is becoming overgrown because the soil is too moist for the tractor to mow (Walter Preiss pers. comm.). Found in this area are scattered blue-green algal mats and patches of ground cover adapted to saturated soil conditions. A water gut runs into the floodplain from the southwest corner and diffuses as sheet flow across the area into the gut to the east and the mangrove swamp. Another gut, which runs across the center of the area to the eastern edge and then along the base of the knoll into the swamp, contains numerous young coconut palms. These have washed down the gut

The Sugar Bay mangrove forest is thought to be extensively influenced by tidal inundation. During high tide, puddles of standing water form at the southern fringe of the mangrove forest where boot prints quickly fill with water. During periods of low tide, there is little standing water.

This mangrove forest plays an extremely important role in filtering suspended solids from runoff water entering Salt River. The water that is in the back bay areas of Salt River is usually quite turbid. Without the filtering of runoff by these mangroves, the sediment load in this estuary presumably would be much greater. Salt River is one of the largest nursery areas for fish and crustaceans on St. Croix. This mangrove forest and fringe around Salt River Bay is largely responsible for maintaining the water quality and providing protection and shelter to juvenile fish and wildlife.

The Dyck Estate, a point of land dividing Triton and Sugar Bays, has been cleared and landscaped. A large coconut grove exists on the property and mangroves fringe the eastern side of the estate abutting Triton Bay.

Flora--Triton Bay

The most northwest portion of Triton Bay has been extensively altered by humans. Just to the south of the Dyck Estate is the Hydrolab Base, where the Saturation Diving Habitat is operated for the National Undersea Research Program (NURP) of NOAA by the West Indies Laboratory, Fairleigh Dickinson University. The Hydrolab Base is the operational center and contains the safety facilities for the habitat. The saturation habitat allows scientists to gain an understanding of the sea they never could obtain without being able to stay submerged for extended periods of time.

Mangroves still line much of the Dyck Estate and Hydrolab Base. To the south, the stands of mangroves again become thicker. Red mangroves dominate the immediate shoreline, with black and white mangroves forming a band along the landward edge. Salt ponds and channels are interspersed with larger areas covered with mangroves. Mangroves dominate the tidal zone. Dry forest vegetation predominates on the more elevated slopes. The dry scrub forest surrounding Triton Bay is continuous and is composed of the same species as described for Sugar Bay. The area is primarily undeveloped and the dense vegetation helps inhibit erosion of the rocky soil.

Abutting Triton Bay and the eastern side of Salt River Bay is Judith's Fancy.

Flora--Judith's Fancy

Judith's Fancy is the name of the estate that forms the eastern shore of Triton and Salt River Bays. The Nature Conservancy's Triton Bay Wildlife Sanctuary lies along the southeastern shore of Triton Bay. Much of this area also is currently proposed for development as a major resort hotel. Mangroves line the shoreline with large trees in undisturbed areas, and both young and stunted trees are recolonizing the more disturbed areas. Much of the area that has been disturbed is covered mainly with grasses and herbaceous plants. Along high points of the headland there are wind-shaped trees and shrubs. The southern portion of this area is overgrown with secondary vegetation consisting of caper, ginger thomas, white manjack, genip and casha. This area has not been disturbed for approximately 20 years, and classic vegetative succession can be observed throughout. Some very dry forest plants are present, such as Yucca, Opuntia and pencil bush (Eugenia spp.). Close to the bay and along the finger channel, red, black and white mangroves and buttonwood are present as are haiti-haiti and seagrape. One large fig tree (Ficus spp.), papaya and flamboyant trees (Delonix regia) are no doubt the result of the earlier activities of humans in the area.

A dirt road runs through the area where human refuse litters the bush. Old and temporary utility poles also litter the area.

When the marina was dredged, a peninsula was formed. On this peninsula, between the finger channel and the bay, are white mangrove, haiti-haiti, West Indian almond (Terminalia catappa), black mangrove, red mangrove, buttonwood, tan-tan, seagrape, ginger thomas, croton, sage, pink cedar (Tabebuia heterophylla), bread and cheese (Pithecellobium unguis-cati), coconut palm and Yucca. Here there is much the same type of ground cover as found along the shore front of the bay. Goats foot, baybean, salt grass, beach grass, burrgrass and Batis are all present.

The area around the abandoned marina is composed primarily of fill material and, as such, contains salt. The area is entirely overgrown with secondary vegetation. Small red, black and white mangroves have begun to colonize around the marina basin. Casha, croton, seagrape, sage, bread and cheese, caper and white manjack are recolonizing the area. Guinea grass is the dominant ground cover species throughout the area. There are a few scattered pipe organ cacti (Pilosocereus royerii).

The man-made crescent beach is flanked by two rock jetties. Along the center of the small man-made bay, casha and seagrape grow along the waterfront. Guinea grass dominates the area with the usual beach type vegetation immediately fronting the water. Within the dense grass, casha, sage, croton, seagrape, and buttonwood are

beginning to take hold. A few larger almond and haiti-haiti also are present. A line of coconut trees, planted in the mid 1960s, stands along the dirt road.

Beyond this crescent beach to the east is a salt pond created during the dredge-and-fill activity. Culverts once were open between the pond, the sea and the marina. The pond itself is deep and is barely visible through the dense vegetation that surrounds it. The surrounding forest consists of red, black and white mangroves, buttonwood, bread and cheese, sage, casha, croton, seagrape and white manjack. Species of grass, sedge and saltwater ground cover make up the understory of this small dense forest.

The shore front of the eastern side of the bay mouth is protected somewhat by the offshore reef. In most areas, the tree line is well back from the beach, but trees grow close to the shore at its easternmost extreme. Goats foot, baybean, purslane, sea rocket and a variety of grasses form the first line of vegetation, behind which are manchineel, buttonwood, bay cedar (*Suriana maritima*), sage, croton, almond, caper and haiti-haiti.

Inland from the shore front vegetation and to the east of the salt pond forest is an area which now is overgrown with dense scrub vegetation. This area was bulldozed and only a few large trees remain. The area now consists of casha, tan-tan, almond, coconut, white manjack, haiti-haiti, bread and cheese, genip, croton, sage and seagrape.

COMPLIANCE

This environmental assessment is intended to provide an overview of potential impacts for the three park alternatives as well as a "no action" alternative. If a new park is authorized, additional site-specific environmental analysis will take place which further evaluates impacts on a more site-specific basis. This evaluation will be accomplished before development is initiated.

Emphasis has been placed on evaluating impacts in accordance with the National Environmental Policy Act and the following laws and executive orders to provide the decisionmaker with a basis for consideration in determining future actions and environmental impacts.

NATIONAL HISTORIC PRESERVATION ACT

Numerous laws affect the manner in which an agency carries out its mission. Of particular importance to this study is the National Historic Preservation Act of 1966 as amended, especially Sections 106 and 110(f) of the Act. Section 106 directs all Federal agencies to take into account the effect of their actions on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on those actions and their effects. Section 110(f) mandates a higher standard of consideration than Section 106 for undertakings that may affect National Historic Landmarks directly and adversely.

EXECUTIVE ORDER 11593

Executive Order 11593 (Protection and Enhancement of the Cultural Environment) and other Federal regulations define the implementing procedures for Section 106 and 110(f) compliance. Federal agencies are required to inventory all historic sites under their jurisdiction and to develop plans for the treatment and preservation of those resources. Where the actions of an agency could result in the loss of resources, timely steps must be taken to record the sites through measured drawings, photographs, histories, and maps of the property to be deposited in the Library of Congress. The Historic American Building Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service has developed standards for recordation and documentation.

The principal implementing regulations for Section 106 and portions of Section 110(f) were promulgated by the Advisory Council and are contained in 36 CFR 800, "Protection of Historic Properties." The regulations set up a consultation process involving the agency, the State Historic Preservation Officers, and the Advisory Council to resolve conflicts between development and preservation needs. In addition, Section 800.10 recognizes the special needs of National Historic Landmarks. Finally, there is a provision in the regulations (Section 800.13) for the development of programmatic agreements. Such agreements provide a mechanism for agencies to fulfill their Section 106/110(f) responsibilities for a particular program, a large or complex project, or a group of undertakings that otherwise would require numerous requests for comments.

The opportunity exists for the involved agencies to gain a broader knowledge of Sections 106 and 110(f) and to work closely with the Advisory Council and the appropriate State Historic Preservation Officer to respond to legal requirements.

COASTAL ZONE MANAGEMENT

The intent of the Coastal Zone Management Act of 1972 (P.L. 92-583) is to stimulate State and territorial leadership in planning and managing the use of coastal areas. The program

seeks to harmonize cultural, economic, and environmental values and balance environmental protection and economic development with a minimum of regulation.

The USVI Coastal Zone Management Act (VICZMA) recognizes a "two-tier" approach to boundary delineation (the extent of the boundary is identified on the USVI Coastal Land and Water Use Map filed with the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration). The first tier comprises those areas with the strongest relationship to the "coastal waters." It extends to the limits of the territorial sea and includes all offshore islands and cays. The second tier of the boundary includes the remaining inland areas. As a provision of the National CZMA, all federally owned lands are excluded from the coastal zone. The National Park Service has determined that the concepts in this study are consistent with the V.I. Coastal Zone Management Plan, but will undertake additional consultation before any development plans are implemented.

As a matter of land and water use policy under the provisions of VICZMA, highest priority is given to water-dependent uses, particularly in those areas suitable for commercial use, including resort hotels and related facilities, port and marine facilities and recreation. Secondary priority is given to those uses that are water related or have special siting needs. In addition, development in areas adjacent to environmentally sensitive areas, such as endangered species habitats, significant natural areas and park and recreation areas, must be sited and designed to prevent impacts which would significantly degrade such areas.

The envisioned park sites generally are within the first tier boundary of the Virgin Islands Coastal Zone Management Plan.

EXECUTIVE ORDERS 11988 AND 11990 FLOODPLAINS AND WETLANDS MANAGEMENT

The U.S. Army Corps of Engineers in its May, 1987, draft report on Estate Mon Bijou/Glynn, two residential areas in the drainage system above the Salt River Bay, stated that there was severe encroachment of the floodplain in the normally dry stream.

During the period 1975-1980, the Corps reported that three major floods occurred in the area which caused widespread damage. It was noted that the distribution of rainfall in the area varies widely during the year. The climate is characterized by long, dry seasons with intermittent periods of high intensity rainstorms. The more intense storms generally result from tropical disturbances that move across the area. These dump large volumes of rainfall over relatively short periods of time. As a result of the intermittent occurrence of rainfall, most of the stream channels are normally dry, discharging only during periods of rainfall.

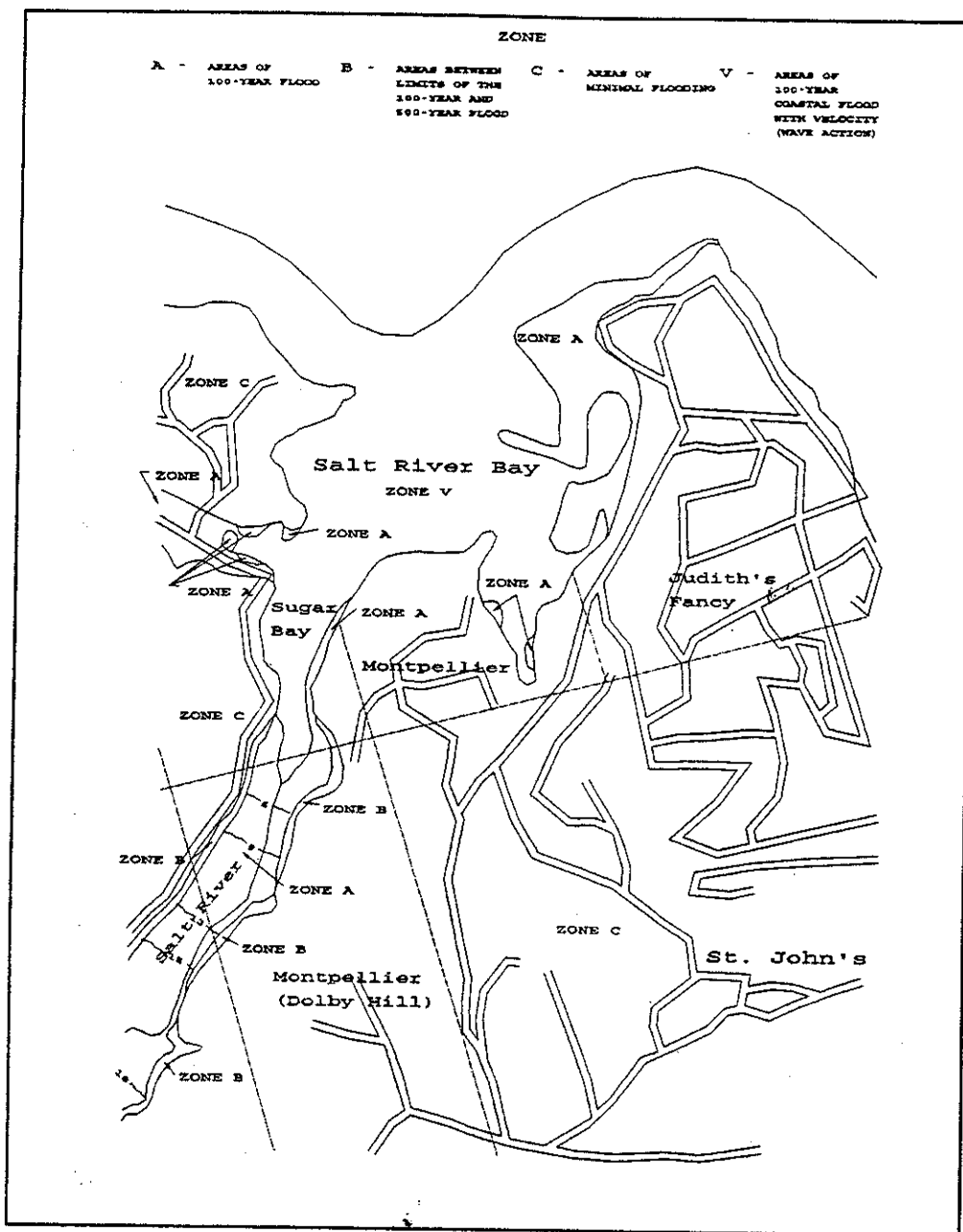


Figure 22 SALT RIVER FLOOD ZONES (FEMA, 1987)

Amphibians

Large marine toads (Bufo marinus) were prevalent, especially after heavy rains when fresh water collected along the roadways. For a complete list of possible residents, see Appendix F.

Invertebrates

Land crabs (Cardisoma guanhumi) are abundant all around the bay and are much sought after by fishermen and crabbers. Ghost crabs (Ocypode spp.) are abundant on the beach, and fiddler crabs (Uca pugnax rapax) are abundant around the salt ponds and dense mangroves. Literally hundreds of fiddler crab holes cover the edges of the salt ponds and floor of the mangrove forest. Rock crabs (Grapsus grapsus) were found on the roots of the mangroves surrounding the bay. Soldier crabs (Coenobita clypeatus) are found in great abundance in the littoral forest surrounding the shoreline.

Flora

The Salt River Bay area consists of floodplains, knolls, and extensive mangrove forests. Some of the present surrounding property is under agricultural use while other areas are residential or commercial.

The area is a mix of habitat types in various conditions. There are undisturbed dry forests, mangrove galleries and freshwater wetlands. Adjacent to these are habitats in various states of recolonization: wetland species reestablishing on filled land, dry forest regaining footholds, and mangrove forests forming around man-made ponds. The area contains a high diversity of habitat types and is replete with examples of vegetative succession, demonstrating nature's ability to recover from the adverse impacts of humans. The area is currently under the threat of development. Both direct impacts from physical disturbance and destruction of sites and indirect impacts from disturbances in the watershed threaten Salt River. Nature is resilient and ecosystems normally recover from natural episodes of stress. Terrestrial and marine species, many of them threatened or endangered, depend on the survival of these systems. If the ability of these systems to function is diminished further, drastic changes will occur to both marine and terrestrial fauna and flora.

Comments on the vegetation begin with the western side of the bay at the Columbus Landing Site and circle the bay in a counter-clockwise direction to the east, ending with Cape of the Arrows at Judith's Fancy.

Flora--Columbus Landing Site

This was once the site of pre-Columbian Carib habitation and later the location of European fortifications. It is now a historical park and a popular public beach. A sandy beach runs westward from the point with some interruption of beach rock around to the Gentle Winds Condominiums. The area where the fort stands is overgrown with scrub vegetation such as tan-tan (Leucaena leucacephala), white manjack (Cordia alba), crotons (Croton spp.) and sages (Lantana spp.). To the west along the shore manchineel (Hippomane mancinella), seagrapes (Cocoloba uvifera) and haiti-haiti (Thespesia populnea) dominate the shore front vegetation. Ground covers in the area include baybean (Canavalia maritima), nickerbean (Caesalpinia crista), sea rocket (Cakile lanceolata), beach morning glory (Ipomoea pes-capre), sandburr (Cenchrus echinatus), salt grass (Spartina patens), beach grass (Distichlis spicata), and sea purslane (Sesuvium portulacastrum).

To the south along the western side of Salt River Bay, the majority of the shore front is lined with red mangrove, black mangrove and a few Jacquinia. Immediately behind these trees are buttonwood and white mangrove. Some of the area immediately behind the mangrove has been cleared for vehicular access and still is being used for dumping of trash. Most of this area is presently overgrown with tan-tan and casha (Acacia tortuosa) and a very few white manjacks.

In the area where the bay dips in toward the road, the thicketed area is wide. Manchineels, buttonwoods, and fish poison trees (Piscidia piscipula) are found behind the mangrove. Along the road, as along most roads, because of continual clearing, tan-tan and other secondary plants, including the territorial flower, ginger thomas (Tecoma stans), are abundant as is guinea grass (Panicum maximum). Along this area on the shoreline there are a few locally endangered stingbushes (Malphigia infestissima). This tree with its glass-like spine on the underside of its leaves is found only on the north shore of St. Croix and on Buck Island. The red and black mangroves continue inland on the coastline and into the marine area. This area has been altered by humans and is now the site of the Salt River Marina. Immediately to the north of the marina, an area has been cleared recently between the road and the mangroves and now only coconut palms (Cocos nucifera) remain.

The marina developer has left many red mangroves that form an island in the center of the marina basin. The marina site was cleared and now has ornamental-type plants. To the south of the marina, the mangroves begin again and continue to the south. Small patches of mangroves have been cleared by fishermen to allow boat launching. In many areas, the road immediately abuts the mangroves. Where there is some distance between the road and the mangroves, the space is taken by dominant species such as haiti-haiti, manchineel, white manjack, ginger thomas, gre-gre (Bucida

buceras), red manjack (Cordia collococca), turpentine (Bursera simaruba), caper (Capparis flexuosa), and (C. cynophallophora), casha, croton, sweetlime (Triphasia trifolia) and varieties of eugenia (Eugenia spp.).

The bay continues southward leading into the Sugar Bay mangrove stand and floodplain.

Flora--Sugar Bay

The property south of the mangrove line has been used for livestock feed production during the past few years. Much of the property is overgrown with wild grasses and shrubs, in part, because of poor soil conditions. In a 1973 aerial photo of the area, much of the property that is now cleared appeared to be covered with trees. A foundation of a house on the western side of the property abuts the mangrove line. At one time, part of the mangrove area was cleared for the operation of a tropical fish farm. This has been abandoned for at least 15 or 20 years and large black mangroves, some more than 50 feet in height, have recolonized the area. A raised roadway was placed through the center of the mangroves to a point about 30 feet east of the southern tip of the open water of Sugar Bay. This road is about 2 to 3 feet above sea level and thus has not been recolonized by mangroves. Some dry scrub vegetation has started to colonize the road because of the lack of usage. The steep hillsides do not appear to have been altered in the recent past.

The upland areas of the Sugar Bay drainage basin consist of steep hills covered with a dry forest vegetation. The dominant species include white manjack, limber caper (Capparis flexuosa), Jamaican caper (Capparis cynophallophora), tan-tan, casha, stink casha (Acacia macracantha), ginger thomas and black mampoo (Torrubia fragrans). Also found in this thick vegetation are mahogany, spiceberry eugenia (Eugenia rhombea), and a preponderance of other dry forest trees (listed in plant list Appendix I). The soils here are rocky and show evidence of previous erosion.

Part of the Sugar Bay floodplain has been cleared by an adjacent property owner and farmer. Much of it, however, is overgrown with grasses, tan-tan, casha, papaya (Carica papaya) and a variety of other opportunistic plant species. Part of it is becoming overgrown because the soil is too moist for the tractor to mow (Walter Preiss pers. comm.). Found in this area are scattered blue-green algal mats and patches of ground cover adapted to saturated soil conditions. A water gut runs into the floodplain from the southwest corner and diffuses as sheet flow across the area into the gut to the east and the mangrove swamp. Another gut, which runs across the center of the area to the eastern edge and then along the base of the knoll into the swamp, contains numerous young coconut palms. These have washed down the gut

The Sugar Bay mangrove forest is thought to be extensively influenced by tidal inundation. During high tide, puddles of standing water form at the southern fringe of the mangrove forest where boot prints quickly fill with water. During periods of low tide, there is little standing water.

This mangrove forest plays an extremely important role in filtering suspended solids from runoff water entering Salt River. The water that is in the back bay areas of Salt River is usually quite turbid. Without the filtering of runoff by these mangroves, the sediment load in this estuary presumably would be much greater. Salt River is one of the largest nursery areas for fish and crustaceans on St. Croix. This mangrove forest and fringe around Salt River Bay is largely responsible for maintaining the water quality and providing protection and shelter to juvenile fish and wildlife.

The Dyck Estate, a point of land dividing Triton and Sugar Bays, has been cleared and landscaped. A large coconut grove exists on the property and mangroves fringe the eastern side of the estate abutting Triton Bay.

Flora--Triton Bay

The most northwest portion of Triton Bay has been extensively altered by humans. Just to the south of the Dyck Estate is the Hydrolab Base, where the Saturation Diving Habitat is operated for the National Undersea Research Program (NURP) of NOAA by the West Indies Laboratory, Fairleigh Dickinson University. The Hydrolab Base is the operational center and contains the safety facilities for the habitat. The saturation habitat allows scientists to gain an understanding of the sea they never could obtain without being able to stay submerged for extended periods of time.

Mangroves still line much of the Dyck Estate and Hydrolab Base. To the south, the stands of mangroves again become thicker. Red mangroves dominate the immediate shoreline, with black and white mangroves forming a band along the landward edge. Salt ponds and channels are interspersed with larger areas covered with mangroves. Mangroves dominate the tidal zone. Dry forest vegetation predominates on the more elevated slopes. The dry scrub forest surrounding Triton Bay is continuous and is composed of the same species as described for Sugar Bay. The area is primarily undeveloped and the dense vegetation helps inhibit erosion of the rocky soil.

Abutting Triton Bay and the eastern side of Salt River Bay is Judith's Fancy.

Flora--Judith's Fancy

Judith's Fancy is the name of the estate that forms the eastern shore of Triton and Salt River Bays. The Nature Conservancy's Triton Bay Wildlife Sanctuary lies along the southeastern shore of Triton Bay. Much of this area also is currently proposed for development as a major resort hotel. Mangroves line the shoreline with large trees in undisturbed areas, and both young and stunted trees are recolonizing the more disturbed areas. Much of the area that has been disturbed is covered mainly with grasses and herbaceous plants. Along high points of the headland there are wind-shaped trees and shrubs. The southern portion of this area is overgrown with secondary vegetation consisting of caper, ginger thomas, white manjack, genip and casha. This area has not been disturbed for approximately 20 years, and classic vegetative succession can be observed throughout. Some very dry forest plants are present, such as Yucca, Opuntia and pencil bush (Eugenia spp.). Close to the bay and along the finger channel, red, black and white mangroves and buttonwood are present as are haiti-haiti and seagrape. One large fig tree (Ficus spp.), papaya and flamboyant trees (Delonix regia) are no doubt the result of the earlier activities of humans in the area.

A dirt road runs through the area where human refuse litters the bush. Old and temporary utility poles also litter the area.

When the marina was dredged, a peninsula was formed. On this peninsula, between the finger channel and the bay, are white mangrove, haiti-haiti, West Indian almond (Terminalia catappa), black mangrove, red mangrove, buttonwood, tan-tan, seagrape, ginger thomas, croton, sage, pink cedar (Tabebuia heterophylla), bread and cheese (Pithecellobium unguis-cati), coconut palm and Yucca. Here there is much the same type of ground cover as found along the shore front of the bay. Goats foot, baybean, salt grass, beach grass, burrgrass and Batis are all present.

The area around the abandoned marina is composed primarily of fill material and, as such, contains salt. The area is entirely overgrown with secondary vegetation. Small red, black and white mangroves have begun to colonize around the marina basin. Casha, croton, seagrape, sage, bread and cheese, caper and white manjack are recolonizing the area. Guinea grass is the dominant ground cover species throughout the area. There are a few scattered pipe organ cacti (Pilosocereus royerii).

The man-made crescent beach is flanked by two rock jetties. Along the center of the small man-made bay, casha and seagrape grow along the waterfront. Guinea grass dominates the area with the usual beach type vegetation immediately fronting the water. Within the dense grass, casha, sage, croton, seagrape, and buttonwood are

beginning to take hold. A few larger almond and haiti-haiti also are present. A line of coconut trees, planted in the mid 1960s, stands along the dirt road.

Beyond this crescent beach to the east is a salt pond created during the dredge-and-fill activity. Culverts once were open between the pond, the sea and the marina. The pond itself is deep and is barely visible through the dense vegetation that surrounds it. The surrounding forest consists of red, black and white mangroves, buttonwood, bread and cheese, sage, casha, croton, seagrape and white manjack. Species of grass, sedge and saltwater ground cover make up the understory of this small dense forest.

The shore front of the eastern side of the bay mouth is protected somewhat by the offshore reef. In most areas, the tree line is well back from the beach, but trees grow close to the shore at its easternmost extreme. Goats foot, baybean, purslane, sea rocket and a variety of grasses form the first line of vegetation, behind which are manchineel, buttonwood, bay cedar (Suriana maritima), sage, croton, almond, caper and haiti-haiti.

Inland from the shore front vegetation and to the east of the salt pond forest is an area which now is overgrown with dense scrub vegetation. This area was bulldozed and only a few large trees remain. The area now consists of casha, tan-tan, almond, coconut, white manjack, haiti-haiti, bread and cheese, genip, croton, sage and seagrape.

COMPLIANCE

This environmental assessment is intended to provide an overview of potential impacts for the three park alternatives as well as a "no action" alternative. If a new park is authorized, additional site-specific environmental analysis will take place which further evaluates impacts on a more site-specific basis. This evaluation will be accomplished before development is initiated.

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EXECUTIVE ORDER 11593

Executive Order 11593 (Protection and Enhancement of the Cultural Environment) and other Federal regulations define the implementing procedures for Section 106 and 110(f) compliance. Federal agencies are required to inventory all historic sites under their jurisdiction and to develop plans for the treatment and preservation of those resources. Where the actions of an agency could result in the loss of resources, timely steps must be taken to record the sites through measured drawings, photographs, histories, and maps of the property to be deposited in the Library of Congress. The Historic American Building Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service has developed standards for recordation and documentation.

The principal implementing regulations for Section 106 and portions of Section 110(f) were promulgated by the Advisory Council and are contained in 36 CFR 800, "Protection of Historic Properties." The regulations set up a consultation process involving the agency, the State Historic Preservation Officers, and the Advisory Council to resolve conflicts between development and preservation needs. In addition, Section 800.10 recognizes the special needs of National Historic Landmarks. Finally, there is a provision in the regulations (Section 800.13) for the development of programmatic agreements. Such agreements provide a mechanism for agencies to fulfill their Section 106/110(f) responsibilities for a particular program, a large or complex project, or a group of undertakings that otherwise would require numerous requests for comments.

The opportunity exists for the involved agencies to gain a broader knowledge of Sections 106 and 110(f) and to work closely with the Advisory Council and the appropriate State Historic Preservation Officer to respond to legal requirements.

COASTAL ZONE MANAGEMENT

The intent of the Coastal Zone Management Act of 1972 (P.L. 92-583) is to stimulate State and territorial leadership in planning and managing the use of coastal areas. The program

seeks to harmonize cultural, economic, and environmental values and balance environmental protection and economic development with a minimum of regulation.

The USVI Coastal Zone Management Act (VICZMA) recognizes a "two-tier" approach to boundary delineation (the extent of the boundary is identified on the USVI Coastal Land and Water Use Map filed with the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration). The first tier comprises those areas with the strongest relationship to the "coastal waters." It extends to the limits of the territorial sea and includes all offshore islands and cays. The second tier of the boundary includes the remaining inland areas. As a provision of the National CZMA, all federally owned lands are excluded from the coastal zone. The National Park Service has determined that the concepts in this study are consistent with the V.I. Coastal Zone Management Plan, but will undertake additional consultation before any development plans are implemented.

As a matter of land and water use policy under the provisions of VICZMA, highest priority is given to water-dependent uses, particularly in those areas suitable for commercial use, including resort hotels and related facilities, port and marine facilities and recreation. Secondary priority is given to those uses that are water related or have special siting needs. In addition, development in areas adjacent to environmentally sensitive areas, such as endangered species habitats, significant natural areas and park and recreation areas, must be sited and designed to prevent impacts which would significantly degrade such areas.

The envisioned park sites generally are within the first tier boundary of the Virgin Islands Coastal Zone Management Plan.

EXECUTIVE ORDERS 11988 AND 11990 FLOODPLAINS AND WETLANDS MANAGEMENT

The U.S. Army Corps of Engineers in its May, 1987, draft report on Estate Mon Bijou/Glynn, two residential areas in the drainage system above the Salt River Bay, stated that there was severe encroachment of the floodplain in the normally dry stream.

During the period 1975-1980, the Corps reported that three major floods occurred in the area which caused widespread damage. It was noted that the distribution of rainfall in the area varies widely during the year. The climate is characterized by long, dry seasons with intermittent periods of high intensity rainstorms. The more intense storms generally result from tropical disturbances that move across the area. These dump large volumes of rainfall over relatively short periods of time. As a result of the intermittent occurrence of rainfall, most of the stream channels are normally dry, discharging only during periods of rainfall.

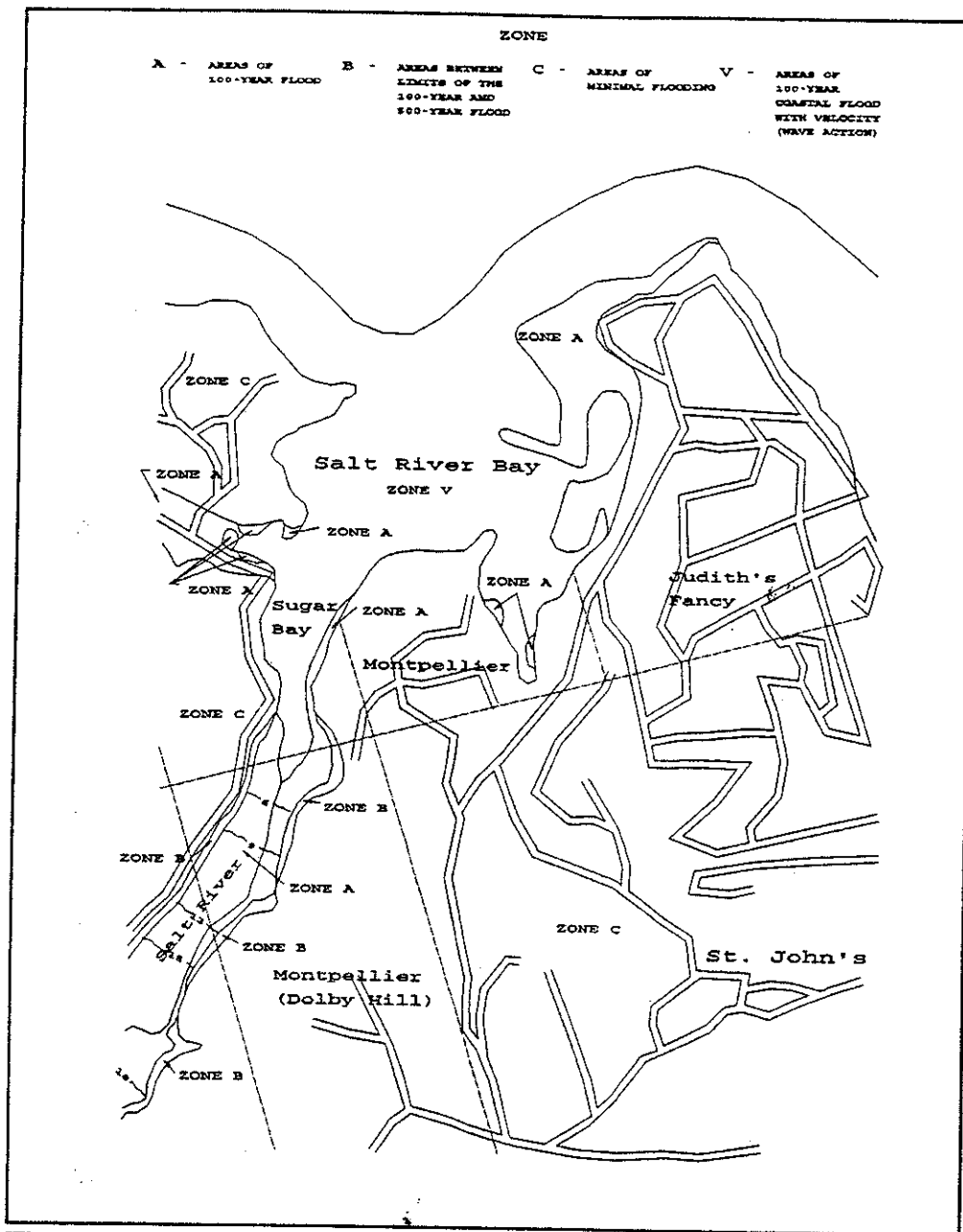


Figure 22 SALT RIVER FLOOD ZONES (FEMA, 1987)

Executive Order 11988 states that each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. Executive Order 11990, in like manner, calls for the preservation and enhancement of the natural and beneficial values of wetlands.

Because of elevation and natural drainage patterns, a portion of the study area lies within the boundaries of the 100- and 500-year floodplains as determined by the National Flood Insurance Program. Almost all of the man-made land to the east of the bay and most of Salt River lie within these reaches.

PRIME FARMLANDS

The Farmland Protection Policy Act is to be recognized as an element of environmental planning. This Act is designed to take into account the impacts on prime agricultural farmlands. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and also is available for these uses--the land could be cropland, pasture land, rangeland, forest land, or other land, but not urban built-up land or water. The Act exempts from the definition of prime farmland that "already in or committed to urban development or water storage." The U.S. Department of Agriculture has determined that land "committed to urban development" includes any land designated for commercial, industrial, or residential use by a State or local government in an operational comprehensive land use plan or in a zoning code or ordinance.

Information furnished by the Soil Conservation Service indicates that prime farmland is adjacent to, but not within, the proposed park area.

Soil erosion during development will be controlled by barriers and silt screens in drainage ways. Replanting of vegetation will be done as necessary.

SPECIAL POPULATIONS

In accordance with the Architectural Barriers Act of 1968, as amended, the Rehabilitation Act of 1973, as amended (Section 504), and the Unified Federal Accessibility Standards (UFAS), the visitor and administrative facilities, services, and programs of the proposed park will be made accessible to the highest level possible and feasible to persons with visual, hearing, mobility, and mental impairments.

NPS Special Population Coordinators and interested persons, including handicapped persons or organizations representing them, will be consulted in the development of plans related to

the project. The coordinators and interested persons will remain involved in the development of more detailed plans, designs, and the interpretive media.

ENDANGERED OR THREATENED SPECIES

Section 7 of the Endangered Species Act of 1973 requires that Federal agencies ensure that their actions do not jeopardize the continued existence of endangered or threatened species or result in the destruction or modification of critical habitat of such species. Informal consultation with the U.S. Fish and Wildlife Service has been continuous throughout the planning process. Additional consultation will take place before any development plans are implemented.

The 1978 amendments to the Endangered Species Act require that a "biological assessment" (a site-specific and detailed evaluation of effects on endangered or threatened species) be conducted prior to the construction or implementation of a Federal action which could impact threatened and endangered species.

Special management protection will be given to those plants and animals that are listed as endangered or threatened species. As management needs and strategies become identified through continuing research, specific management plans will be developed for some individual species. The NPS will consult with the FWS before implementing any action that may affect listed species.

The FWS identified 10 species currently classified as endangered and three species classified as threatened that should be considered during the planning process. These species are listed in Appendix J.

ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE ACTIONS

INTRODUCTION

This section outlines the environmental consequences of the four alternatives as described in the previous sections.

Three park development alternatives have been proposed for the Salt River study area. Each alternative will have varying consequences on the environment, although there are generic impacts in developing any waterfront site, such as location in the floodplain, increased runoff, the need for dredging to allow boat access close to the shoreline, disposal of dredge material, the use of pilings for construction of facilities, and economic effects on the surrounding area resulting from visitor use. The consequences are considered generally, ecologically, culturally, economically, and socially. Alternative A is the smallest of the three options and is included in both of the larger alternatives. The largest alternative, C, includes environmental consequences from both A and B.

At this stage, no historic properties other than the Columbus Landing Site have been determined eligible by the Virgin Islands State Historic Preservation Officer for nomination to the National Register of Historic Places. In the future, a determination of eligibility will be sought for properties that appear to qualify for the National Register based on additional archeological and historical research.

There are some impacts common to all of the alternatives. These include impacts from park development and visitor use as well as the potential for protection.

Park development has in common for each of the alternatives the construction of an orientation station or visitor center/museum, maintenance building, parking facilities, road construction, trail and exhibit construction.

Visitors impact the resources by trampling the vegetation, compacting the soils, polluting the waters and air, eroding the forts by climbing or walking upon the historic fabric and removing or destroying cultural and natural resources.

Development of a park at the Salt River/Columbus landing site could increase use of the area to a considerable degree. This increased use could have indirect impacts on the island's infrastructure, relative to roads, traffic, accommodations, food services, and various other required services.

Certain steps can be taken to minimize or mitigate the potential for protection of the resources. These include but are not limited to the following:

1. New construction will avoid critical cultural and natural resources areas;
2. New trail construction will avoid areas with high erosion potential and locations with endangered or threatened species;
3. Clearing for construction other than for roads will be done selectively in order to leave canopy trees where possible. These areas also will be investigated in detail for endangered or threatened species, and the habitats of any such species found will be avoided;
4. Road construction contracts will include provisions for control of erosion during construction;
5. The effects of construction on water quality will be mitigated to prevent sediment from reaching streams by conforming to territorial rules and regulations for the control of soil erosion and sedimentation; earth cut slopes, embankments, and shoulders will be seeded and mulched; topsoil suitable for plant establishment will be stockpiled and used on the finished slopes; natural drainage channels will be directed under the road by pipe culverts; brush barriers and silt screens will be placed in hollows to act as silt basins that will reduce the amount of downstream siltation from construction and during roadbed excavation. Temporary drainage channels will be cut to divert surface runoff to natural drainage areas;
6. Heavily used parking areas will be designed with walkways and other structures to reduce erosion;
7. Sewage treatment facilities will be designed to produce effluents that meet Federal and territorial standards;
8. Parking areas will be designed and constructed to collect rainwater and convey it to natural stream channels without causing erosion;
9. The effects on air quality resulting from road construction and other construction activities will be mitigated where possible by procedures such as sprinkling water on roads, detours to control dust, and disposing of brush and tree limbs with chippers rather than burning. Construction and use will meet territorial air quality standards;
10. Road scars will be seeded to provide vegetative cover;
11. Consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Officer in accordance with 36 CFR 800 and the Programmatic Memorandum of

Agreement between the NPS, the Advisory Council and the National Conference of State Historic Preservation Officers will help ensure the proper treatment of cultural resources.

SUMMARY CHART

	Alternative A	Alternative B	Alternative C
Acreage	20 Acres of Land	145 Acres (110 Land and 35 Water)	1000 Acres (393 Land and 607 Water)
Cost	\$2.25 Million	\$13 Million	\$23.5 Million
Development	\$3.3 Million	\$11 Million	\$11.1 Million
Staffing	\$303,000 (About 12 Jobs)	\$474,000 (About 18 Jobs)	\$474,000 (About 18 Jobs)
Themes	Cultural* (Archeological/ Historical)	Cultural* (Archeological/ Historical)	Cultural*/Natural
Key Features	Indian Village Site Ceremonial Ball Court European Fortifications Limited Natural Resource Area	Indian Village Site Ceremonial Ball Ct. European Fortifications Partial Mangrove Protection Recreational Use	Indian Village Site Ceremonial Ball Ct. European Fortifications Cape Burial Grounds Preserved Historic Scene/Setting Partially Preserved Facets of European Colonial Exploration Extensive Mangrove Protection Estuarine Resources Preserved Submarine Canyon Preserved Water Surface Preserved Recreational Use NOAA and FWS Interest

* Includes the demise of Carib Peoples and their culture.

Develop- ments	Orientation Station (2,500 Square Feet)	Visitor Center/ Museum (5,000 Square Feet)	Visitor Center/Museum (5,000 Square Feet)
	Maintenance Building (800 Square Feet)	Orientation Station (625 Square Feet)	Orientation Station (625 Square Feet)
	Parking (80 Cars)	Maintenance Building (1,500 Square Feet)	Maintenance Building (1,500 Square Feet)
	Road Construction (2,125 Linear Feet)	Parking (215 Cars)	Parking (215 Cars)
	Trail Construction (2,000 Linear Feet)	Road Construction (12,525 Linear Feet)	Road Construction (12,525 Linear Feet)
	Exhibit Construction (2 Items)	Trail Construction (13,750 Linear Feet)	Trail Construction (13,750 Linear Feet)
		Exhibit Construction (12 Items)	Exhibit Construction (12 + Kiosk)
Potential Impacts	Loss of Vegetation	Loss of Vegetation	Loss of Vegetation
	Visitation	Visitation	Visitation
	Social	Social	Social
	Economic	Economic	Economic
	Water Quality**	Water Quality**	Water Quality**
	Wildlife	Wildlife	Wildlife
	Archeological	Archeological	Archeological
	Resources	Resources	Resources
	Historic Setting	Historic Setting	Historic Setting

** Erosion and runoff can cause declines in water quality due to increased siltation and sediment loads which may have effects on aquatic vegetation, fish, etc.

ALTERNATIVE A: COLUMBUS LANDING SITE PARK

GENERAL

Alternative A will encompass 20 acres on the western side of Salt River Bay. Proposed site improvements include a ranger station and a small maintenance area (totaling 3,300 square feet), two covered exhibits, stabilization of the two European forts, and a 2,000-foot history trail. The buildings, 80 parking spaces, and other necessary facilities will be designed in such a way to keep resource impacts to a minimum and to blend with the historic scene. An interpretive demonstration area showing Carib family life may be created for the years surrounding the Quincentennial. Standards from NPS-28 concerning restorations should be carefully followed in the development of the small demonstration area.

A central ranger station with public facilities is envisioned for orientation, interpretation and information dissemination. Although some vegetation (4,500 square feet) would be destroyed by construction of the building, entrance route (2,125 linear feet) and parking area (30,000 square feet), these necessary facilities would be developed with the least possible impact to the resources. They also would be constructed in such a way as to blend into the historic scene without creating an obvious intrusion on the landscape. Natural screening (i.e., trees, vegetation, etc.) would be used around the developments to soften the scene for those viewing the bay from higher elevations.

Development of a Columbus Landing Site Park could increase the use of the area tenfold or more. This increased use will pose a potential impact to the area's resources and to adjacent landowners. It also would decrease the currently available "open space." Development of commercial businesses and private homesites that could occur in the area could be relocated to other parts of the island.

Alternative A would provide protection to the significant cultural and natural resources of the area and give greater security to its users. Controlled access also would provide less impact from inappropriate uses. Vehicular damage to the resources, pollution of the land and adjacent waters from garbage and litter, pilfering of artifacts, and general security to park users and neighbors alike would be better managed through controlled access.

The development of a detailed Salt River management plan is necessary to address area management, including numbers and types of users, user restrictions, access, boating, and other concerns such as the development of cooperative agreements regarding recreational fishing on adjacent waters, etc.

ECOLOGICAL

The Alternative A park area contains a beach which is sandy to rocky in character, with fringe mangrove habitat, wooded knolls and grassy flatlands. The ranger station, parking and amenities will eliminate some of the currently available open space on the site and increase the chances for erosion and runoff. Controlled construction and planting of vegetation both before and after development will mitigate erosion and runoff. Soil erosion during development also will be controlled by barriers and silt screens in drainage ways.

Active management and maintenance of the beach will limit many of the negative impacts of current activities. Management will provide a cleaner beach through consistent and thorough maintenance. Rest room facilities will help eliminate the human waste now found along the beach area.

Cutting of beach vegetation for firewood will be eliminated, thus allowing for natural growth of the vegetation that will provide for greater beach and soil stabilization, shade for beach users, and enhance use by birds for nesting, feeding and roosting.

The park also will control turtle and turtle egg poaching and sand mining in the area. Active monitoring of the beach for sea turtle nesting and enforcement of certain restrictions necessary to protect nesting sites will be incorporated into the management plan.

Alternative A also includes a portion of mangrove wetland and a former salt pond along the northwestern edge of the bay. By redirecting the drainage patterns back to a more natural flow and using the pond as a catchment basin for runoff, the pond can be restored. This action could provide greater protection to the mangroves and thus enhance wildlife habitat, including the restoration of a fisheries nursery. The presence of the park also will eliminate the refuse dumping in the mangrove area.

Some of the bench and knoll areas of lesser importance will be altered by the development of park facilities, parking, ranger station and interpretative signs for the historic and natural resources.

The introduction of impervious surfaces (i.e., concrete, asphalt, etc.) will increase the potential for erosion and runoff, but rehabilitation of the flatlands, including the removal of certain roads as well as revegetation activities, will limit soil erosion and runoff into the adjacent waters.

CULTURAL

Numerous significant cultural resources will be protected within Alternative A including the two European fortifications and the Indian village with its ceremonial ball court. Increased

resource protection will help limit pilfering of artifacts. Although pedestrian traffic around the site may increase the potential for erosion, this will be mitigated by utilizing boardwalks when necessary. Closure of the dirt road to the edge of and between the old forts will lessen erosion of those sites and help protect the historic structures.

The history trail will increase awareness of the resources and historical continuity of the area. It also will create greater sensitivity to the Salt River Bay area and the Virgin Islands' resources in general. Stabilization of sections of the forts and the use of wayside exhibits will provide interpretative opportunities leading to a greater appreciation and care of the resources.

ECONOMIC

The presence of a Columbus Landing Site Park will increase visitors' interest in the area and will add to the length of their visits on St. Croix and the Virgin Islands. It will have a positive multiplier effect on the island's economy, especially during the Columbus Quincentenary years (1992-1993).

The economic importance of this site should be significant to the island for the park will have both direct and indirect economic impacts. The park will employ approximately 12 individuals as park supervisors, rangers/interpreters and maintenance workers. It is estimated that the majority of their earnings will go into the local economy.

Indirectly, the park will become a special attraction bringing tourists who will spend money inside and outside the park while visiting St. Croix. Commercial and residential development which would have taken place in the park could take place in other parts of the island. Some reduction in jobs or other economic benefits is possible, but this impact will be offset, in part, by park-related economic benefits.

The impact for those living in or having businesses within the area selected for a park would be lessened under the provisions of Public Law 91-646 which provides for relocations assistance. Help would be available through the relocations assistance officer in the Southeast Regional Office of the National Park Service, if the Federal Government were involved in the acquisition of lands.

SOCIAL

Alternative A will affect the quality of life of Cruzans. It will preserve open space and cultural resources which are part of the local heritage. Beach recreation and camping which now occur contribute to pollution of the land and waters. Steps to minimize pollution such as proper maintenance and the availability of rest rooms should decrease pollution below the current level.

The park also will provide public environmental education programs to help instill pride in the environment and to provide a greater knowledge of the Cruzans' heritage. The proposed park should attract Cruzans, residents and visitors to the island.

ALTERNATIVE B: COLUMBUS LANDING SITE AND CAPE OF THE ARROWS PARK

GENERAL

Alternative B will encompass approximately 110 acres of land, including all of the Columbus Landing Site in Alternative A, a portion of the Cape of the Arrows (the east side of Salt River Bay), and the Nature Conservancy land. All of the amenities planned in Alternative A will be included plus nature trails (11,750 feet) and 10 additional waysides. An approximately 5,000-square-foot visitor center/museum complex with a sales center for books and crafts also is envisioned.

Alternative B will increase considerably the use of both sides of the bay, especially on the Cape of the Arrows, an area not much used at present. This increased use will pose a potential impact to the area's resources and to adjacent landowners. The development of the park also would require that commercial businesses and private homesite developments planned for the site be located in other areas of the island.

Alternative B would provide protection to the area's significant cultural and natural resources and provide, where none now exists, greater security to area users. Controlled access would provide less impact from inappropriate uses such as sand mining and destruction of vegetation. Vehicular damage to the resources, especially parking on the historic forts, pollution of the land and adjacent waters from human waste, garbage and litter, and pilfering of artifacts also would be better managed through controlled access.

ECOLOGICAL

Park designation would provide significant protection for the area's cultural and natural resources. Elimination of random roadways will tend to protect the area from erosion and reduce air pollution. A paved road system and parking areas will increase the amount of impervious surfaces of the site, but careful construction activities with the planting of native species will mitigate soil erosion and runoff into adjacent waters.

Alternative B will include a larger area of mangroves than Alternative A, plus additional beach, flatland and dry forest areas. Inclusion of the Cape of the Arrows portion of Salt River will protect the resources along the east side, including the fringe mangroves, salt

ponds, and woodlands. Additional protection will be provided to the recovering salt pond, so that the native flora and fauna and resultant shoreline stability should increase in time.

The preservation of a larger area of watershed, mangroves and wetlands will significantly help protect water quality in the bay. These marine resources are part of a much larger process that will greatly benefit from protection of the terrestrial resources as well.

Alternative B, like Alternative A, will reduce turtle and turtle egg poaching and sand mining. Active monitoring of the beach for sea turtle nesting and enforcement of certain restrictions necessary to protect nesting sites will be incorporated into the management plan. The presence of the park also will inhibit the cutting of mangroves and other trees for firewood. Vehicular damage to the resources, pollution of the land and waters from garbage dumping, and other inappropriate uses will be better managed through controlled access.

The deeper artificial bay will be utilized for boat docking for water access to the Cape of the Arrows. A small unobtrusive dock structure will be required along the west shore of this bay to avoid impacting the recovering mangroves that surround the bay. Construction of the dock will result unavoidably in minor and temporary water sedimentation.

The Cape of the Arrows portion of the park would be closed at night to all visitors except those registered in the campground. This will limit some activities that currently occur on the east side of the bay, such as crabbing and night fishing from the shore. This general elimination of nighttime activities should result in an increase of the land crab populations. There is no subsistence fishing at Salt River Bay, therefore, there will be no impacts on local residents.

The introduction of impervious surfaces (roadways, buildings and parking lots) will affect the runoff and has potential for increased erosion and sedimentation. However, the removal of inappropriate roads, together with habitat restoration will greatly offset cumulative impacts. The setting of dock pilings is recognized as a disturbance of marine resources. Care will be exercised to minimize disturbance. Piers will be located to avoid impacting any significant bottom habitats.

The ruins of a late 1960s hotel¹ would be removed, restoring some semblance of the natural scene. This same area would be rehabilitated to natural vegetation, and a trail could be

¹The incomplete, unfinished shell of the hotel was built upon reclaimed land and not upon historic ground. Its nomination to the National Register of Historic Places is remote because it is neither 50 years old nor does it possess transcending importance either architecturally or historically.

constructed to the man-made point in the bay. Benches and a wayside exhibit could be placed at the point to interpret the natural scene and biological continuum. This interpretive opportunity will create greater understanding of the ecosystem processes and appreciation for the protection of the natural environment.

Alternative B will provide for environmental education programs that will increase sensitivity to the local flora and fauna. The filled land that is now mostly bare will be planted for soil stabilization and wildlife use. Portions of the area will be set aside for picnicking and other recreational activities as an adjunct to a park visit.

In addition, Alternative B will limit additional commercial development within the proposed park boundaries. It also will serve to influence improper development activities adjacent to the park when those proposed activities are likely to impact upon the park's significant natural and cultural resources.

CULTURAL

The addition of Cape of the Arrows will provide protection to an extensive pre-Columbian burial and village site. The park will protect those resources from both direct and indirect impacts, including pot hunting and pilfering of antiquities. A museum on the Cape of the Arrows will be built above the 500 year flood zone to protect and store the valuable artifacts and historical documents. Professional curation will be required, and the site will provide a repository for pre-Columbian and post-Columbian materials, including examples of Afro-Caribbean cultures and their contributions to the Americas.

Prior to undertaking any ground disturbing activities, an archeological survey and clearance will be obtained for the affected area. The visitor center will be constructed to avoid impacts to the historic scene and the archeological resources.

A craft center for craft construction and education, as well as craft sales, also is envisioned as part of the visitor center complex. This function will provide for local involvement and community awareness.

Short trails will be developed to enable visitors to view the historic sites and on-going archeological excavations. These trails will create minimal disturbances and visual impacts and boardwalks will be used to mitigate impacts when necessary.

ECONOMIC

Alternative B will expand the economic opportunities of the park. The larger park will have a direct impact on St. Croix's economy by employing at least six more people than the smaller park. This number of employees would boost the payroll to \$624,000, thereby adding to the

local economy. The larger park also will attract more tourists and residents, in part by presenting greater opportunities to buy and sell island arts and crafts. The proposed park has the potential as an outlet for local cottage industries manufacturing items of interest. As with Alternative A, economic impacts from residential and commercial development will be foregone; however, this will be mitigated with economic benefits from tourism and park-related construction.

Commercial and residential development which would have taken place in the park could take place in other parts of the island. Some reduction in jobs or other economic benefits is possible, but this impact will be offset, in part, by park-related economic benefits.

SOCIAL

Alternative B will protect additional areas of Salt River Bay which are a significant part of the Virgin Islander's culture and background. Current uses of the areas will be maintained and enhanced. Only nighttime activities on Cape of the Arrows will be somewhat limited for protection of the significant natural and cultural resources. Benefits will accrue to the adjacent homeowners through increased security on park lands.

The crescent beach area will be maintained for recreational use, although use after dark will be limited to registered campers only. This site also will provide an excellent opportunity for teaching water sports to school children.

Alternative B will provide beach facilities and picnicking opportunities, nature walks to the mangroves and salt pond, and other environmental education opportunities that will increase environmental awareness and appreciation.

ALTERNATIVE C: COMPREHENSIVE SALT RIVER PARK

GENERAL

Alternative C is the largest of the three proposed park development options. It will incorporate all components of Alternatives A and B, and will contain all of the Salt River shoreline, the peninsula between Sugar and Triton Bays, and all of the marine area of Salt River Bay, including the bay proper and the submarine canyon to a depth of approximately 300 feet. This alternative will encompass a total of approximately 1,000 acres of land and water. It will include the same amenities provided in Alternatives A and B. It also suggests, for future consideration, two scenic greenbelts and numerous overlooks, an observation point on the hilltop of the peninsula, an important wildlife preserve, and many other opportunities for visitor use and enjoyment.

An unobtrusive observation point (350 square feet) is proposed for the hilltop of the peninsula. From this site visitors can view the entire Salt River watershed and gain an understanding of the importance of the whole watershed as a complete ecosystem. The impact of widening an existing road, adding a gravel parking lot (1,500 square feet), and observation point would be minimal, as long as the construction is undertaken in an environmentally sensitive manner.

ECOLOGICAL

Alternative C will protect the remaining mangroves along the Salt River shoreline as well as the significant watershed on the adjacent hillsides, thereby providing necessary protection to the estuary for the long-term perpetuation of the marine environment.

Sugar Bay contains the largest intact mangrove system remaining in the USVI. Sugar Bay will be retained in its natural condition, so that its ability as a cleansing system and as a "control" for the remainder of the Salt River natural system will continue.

The protection of the Salt River estuary is vitally important to numerous commercial fish species, as well as rare and endangered plant and animal species. In preserving the wetlands and floodplains, the water quality within the bay will be protected.

Certain portions of the Sugar Bay floodplain will require restoration to increase the area's ability as a natural filter. Water catchment features in the upland and upstream portions of the park may be required. A management plan should be developed for the entire park ecosystem in conjunction with the watershed management plans by the U.S. Corps of Engineers for the upper watershed of Salt River. This alternative will place the entire Salt River area under a management regime that will provide greater emphasis on resource protection.

The "Aquarius" facility, located at Triton Bay, is owned and operated by NOAA's National Undersea Research Center. It is an important center for marine research managed by Fairleigh Dickinson University. Alternative C will provide greater protection to the Salt River marine system in which the lab operates. Operations of the lab will continue within the park, and cooperative activities will be developed for long-term monitoring and research. Also, the possible development of an environmental education center within the Triton Bay area should be examined at a later time. Such a center could have strong ties to the communities and schools. Center activities could lead to a greater understanding of the important natural resources and processes of Salt River.

Alternative C will protect the largest of the remaining estuaries in the USVI. Enforcement of existing laws will limit unlawful fishing practices which currently occur within the area. The developers of the park will need to establish a comprehensive mooring plan to

encompass both the inner bay and the submarine canyon. This plan will provide for the protection of sensitive marine communities by prohibiting anchoring within the defined areas.

Impacts can be anticipated from oil and gas leaks from motor boats as well as from other pollutants such as antifouling bottom paints.

Alternative C like Alternative B will limit additional commercial development within the proposed park boundaries. It also will serve to influence improper development activities adjacent to the park when those proposed activities are likely to impact upon the park's significant natural and cultural resources.

CULTURAL

The Danish Customs House will be included and given protection under Alternative C. This site, which is proposed to be stabilized, will help visitors better understand the historical continuity of the Salt River area. The historic scene will be restored to the detriment of some vegetation that has overgrown the structure. Because this site is so close to the roadway, road realignment and minimal parking will be necessary. Careful attention to potential soil erosion and runoff into the adjacent bay must be given the area during construction.

Impacts from visitor use and development will be the same as for Alternative A and B.

Improved motor vehicle and trail access to the various points of interest will increase the opportunity for interpretation and visitor appreciation of the site. Higher visitation will result in additional wear on historic fabric but will be offset by increased cyclic maintenance and greater protection by law enforcement personnel.

Additional cultural sites may be found during further site surveys. All historic sites and antiquities, including marine archeological resources, will be better protected by Alternative C.

ECONOMIC

The increased size of Alternative C will demand more employees and support services than Alternative A. It is estimated that 18 FTE with operating funds estimated at \$624,000 will be required. Increased visitation will both directly and indirectly affect the island's economy. Greater numbers of employees and visitors will stimulate opportunities for entrepreneurs outside of the park. Certain in-park opportunities, such as concession operations, also will contribute to the economic growth of the community.

The commercial marina facility, which currently lies within the Alternative C area, would continue to operate and could have potential for expansion of its services to provide marine park tours and other compatible activities and services. The commercial activities permitted within the park would be included within a Salt River management plan.

In addition, Alternative C will provide for greater long-term perpetuation of the marine fisheries that are vital to the economy of St. Croix's fisheries industry.

Commercial and residential development which could have taken place in the park could take place in other parts of the island. Some reduction in jobs or other economic benefits is possible, but this impact will be offset, in part, by park-related economic benefits.

SOCIAL

Alternative C will protect one of the few remaining open areas and an important remnant of the heritage of the USVI. It will retain a large undeveloped area for future generations that will become increasingly important as other areas on St. Croix become commercially developed.

Alternative C will allow for the continued use of the area for fishing and crabbing in accordance with Virgin Islands law. These important resources should be improved through effective management policies. In addition, the boat launching site in Sugar Bay will be improved for safety and access.

Increased use of the area could have impacts upon the infrastructure of the island, relative to roads, traffic, accommodations, food services, and various other required services. Although all of these requirements will be beneficial to the economy of St. Croix, each must be acknowledged and planned in anticipation of expected park visitation. The number of employees needed to satisfy these numerous services also will add to the increased demands for automobiles, homes, food, and other amenities. This larger park will include a wider variety of resources which, in turn, will create greater involvement and use and will lead to a greater concern about resources and their long-term perpetuation.

ALTERNATIVE D: NO ACTION

GENERAL

The "no action" alternative implies that no further action will be taken to discontinue a present practice or to mitigate existing or proposed development. There will be a continuation of existing conditions and trends including management of the

5-acre site by the USVI Government. Available regulatory authorities would be used to manage and to develop private lands in the study area. The private sector would most likely manage the area to maximize economic development.

Four separate commercial enterprises have proposals to develop major portions of the Salt River shoreline for hotels, condominiums, marinas, convention center, and other related commercial facilities.

The "no action" alternative undoubtedly will result in significant environmental consequences that will seriously impact the entire natural ecosystem of Salt River and increase the decline of the area's historic integrity.

If the property is not utilized substantially as proposed under one of the other alternatives, it is probable that the site would be developed for intensive commercial and/or residential use as allowed in the current zoning of the property.² Such use would be more intensive than that envisioned under the other three alternatives. Public access generally would be restricted to the 5 acres presently under USVI control.

ECOLOGICAL

Any development along the eastern shoreline, such as the proposed 300 condominium units and a 288-room hotel at Cape of the Arrows, has the potential for causing extensive water degradation within the Salt River Bay system. Silt and debris impacts, if not mitigated, could have serious effects on the natural systems, including the mangroves and fisheries nursery.

Developments along the western shore of Salt River also could create additional impacts to the natural system such as loss of wetlands and mangroves and hasten the decline of Salt River as a natural area that supports important fisheries, protects recreational opportunities, and preserves the heritage of the people. Increased damage to the coral and marine environment from increased boat traffic and marina construction could also impact the bay and reefs.

Human waste, garbage and debris will continue to degrade the environment in the uncontrolled areas.

²The reader is referred to the Virgin Islands Zoning, Building and Housing Laws and Regulations (June 1984), for the multiple uses permitted as a matter of right and uses permitted subject to other conditions.

CULTURAL

Significant historic sites could be lost by commercial development. There is an increased risk that archeological resources will be lost or destroyed under this alternative. Furthermore, there will be a loss of historic setting as unsympathetic development (commercial and residential) takes place on land that is now open.

The road across the fort area will continue to diminish the character of the cultural resources.

ECONOMIC

The loss of significant natural, recreational and historic resources could impact the tourist industry negatively by eliminating or reducing the quality of unique resources most likely to attract tourists.

SOCIAL

This item includes the same considerations included in Alternatives A and B. It is anticipated however, that each social benefit considered would be lost or lessened to the general public through the selection of a "no action" alternative.

ADDITIONAL AUTHORITIES

While the Secretary of the Interior has many authorities available, certain additional authorities would be required if Congress acts to implement one of the alternatives. Legislation should be stated clearly to include authorization for the Secretary to:

1. Construct or assist in the construction of an entrance road(s) outside the park boundary or to modify existing roads for access to visitor facilities. A proviso calling for consultation with the USVI is appropriate.
2. Obtain utility easements, especially for water supply, outside the park boundary if the park is not capable of supplying visitor needs from within the park. A proviso stating that this easement would not be charged against any land acquisition ceiling is desirable because of the tightly configured boundaries.
3. Create an advisory committee, representing a broad cross-section of community concerns, to furnish expert advice, ideas, and diverse options concerning the management of the park.

SUMMARY STATEMENTS RELATING TO SUITABILITY AND FEASIBILITY

A. SUITABILITY FOR PARK USE

The outstanding cultural and natural resources of the site, together with its significance as the only site definitely associated with Columbus on U.S. soil, has merit as a proposed territorial park or unit of the National Park System.

The alternatives to create a Salt River/Columbus Landing Site Park at Salt River Bay, St. Croix, address several history and prehistory themes and subthemes representative of the cultural heritage of the area. These are identified in the 1987 report, "History and Prehistory in the National Park System" and are used to show the extent to which units and cultural resources of the National Park System, affiliated areas and National Historic Landmarks reflect the Nation's past. They are:

I. CULTURAL DEVELOPMENTS: INDIGENOUS AMERICAN POPULATIONS.

A. The Earliest Inhabitants

14. Archaic Adaptations of the Caribbean

B. Post-Archaic and Pre-Contact Developments

17. Caribbean Adaptations

C. Prehistoric Archeology: Topical Facets

1. Prehistoric Architecture/Shelter/Housing
2. Prehistoric Technology
3. Prehistoric Social and Political Organizations
5. Prehistoric Arts
7. Prehistoric Diet/Health
8. Prehistoric Trade
9. Prehistoric Warfare
10. Prehistoric Religion/Ceremonialism
11. Prehistoric Social Differentiation
12. Prehistoric Settlements and Settlement Patterns
15. Prehistoric Transportation/Travel
16. Prehistoric Agriculture/Plant
Domestication/Horticulture
17. Prehistoric Animal Domestication

- 18. Prehistoric Demographics
- 19. Prehistoric Cultural Change
- 23. Paleoecology
- 24. Prehistoric Human Physical Remains

D. Ethnohistory of Indigenous American Populations

- 1. Native Cultural Adaptations at Contact
 - k. Native Adaptations to Caribbean Environments
- 2. Establishing Intercultural Relations
 - e. Defending Native Homelands
 - g. Introductions to Foreign Religious Systems
- 3. Varieties of Early Conflict, Conquest, or Accommodation
 - b. Forced Population Movements
 - 2. The Changing Cultural Geography of the Caribbean
 - 3. New Inter- and Intragroup Alliances
 - 4. Military Removal and Concentration
 - c. The New Demographics
 - 1. Disease and Massacres
 - 2. Depopulation of Terrain
 - 3. Captives, Slaves

II. EUROPEAN COLONIAL EXPLORATION

- A. Spanish
 - 1. Caribbean-represented by San Juan National Historic Site, P.R. (Unit, National Park System)
 - Columbus Landing Site, VI (National Historic Landmark)
 - La Fortaleza, P.R. (National Historic Landmark)
- B. French
 - No Caribbean representation
- C. English
 - No Caribbean representation

D. Other European

1. Scandinavian (Danes)-represented by Christiansted
National Historic Site, VI and Virgin Islands
National Park, VI (Units, National Park System)
-Fort Christian, VI (National Historic Landmark)
2. Dutch (1640-1650)
- No Caribbean representation

XI. AGRICULTURE

- A. Era of Adaptation 1607-1763
- No Caribbean representation
- B. Plantation Agriculture, 1607-1860
- No Caribbean representation

XVIII. TECHNOLOGY (ENGINEERING AND INVENTION)

- E. Military (Fortifications)-represented by San
Juan National Historic Site, P.R. (Unit, National Park System)

XXX. AMERICAN WAYS OF LIFE

- A. Slavery and Plantation Life
-No Caribbean representation

In like manner, the National Park System Plan -- Natural History (1972) -- addresses several themes from the best examples of our great national landscapes, shores and undersea environments; the processes which formed them, and the life communities that grow and dwell in them.

The U.S. Virgin Islands are represented by the various themes and examples as follows:

Landforms of the Present

Mountain Systems
Virgin Islands National Park

Works of Volcanism
Virgin Islands National Park

Seashores, Lakeshores, Islands
Buck Island Reef National Monument

Virgin Islands National Park

Coral Island, Reefs, Atolls
Buck Island Reef National Monument
Virgin Islands National Park

Geologic History

Paleocene-Eiocene Epochs
Virgin Islands National Park

Oligocene-Recent Epochs
Buck Island Reef National Monument
Virgin Islands National Park

Land Ecosystems

Tropical Ecosystems
Buck Island Reef National Monument
Virgin Islands National Park

Aquatic Ecosystems

Marine Environments
Buck Island Reef National Monument
Virgin Islands National Park

Estuaries
Virgin Islands National Park

When the Salt River Bay area was analyzed for National Natural Landmark status, three themes were cited:

Land Communities of Plants and Animals
Theme 28. Tropical ecosystems

Aquatic Ecosystems
Theme 29. Marine environments
Theme 30. Estuaries

An update of the Theme Structure showing current NPS units by theme and by physiographic region is in draft and is expected for publication in 1990.

Selection and further development of these themes would come through the future General Management Plan and Interpretive Prospectus planning processes. These plans will explain

in more detail the questions of how, where, and through what media the interpretive message should be explained or presented to the visitor.

An important consideration, one essential to the understanding of suitability, relates to how well the resources at Salt River Bay compare to those already protected in other areas of the National Park System. In this case, a comparison with Virgin Islands National Park and Buck Island Reef National Monument follows:

Salt River's long history of human habitation and use (since at least AD 350), and sequence of recorded events that occurred there make it the premier archeological and historical site in the Virgin Islands. It should be noted that the earliest human presence at Salt River most probably resulted from an appreciation of the abundant natural resources to be found there. Since that time, the significance of the cultural and the natural resources has been inextricably entwined. The following is a comparison of the three cultural periods relevant to the area.

**PREHISTORIC
(AD350-1520)**

Virgin Islands National Park and Buck Island Reef National Monument contain prehistoric archeological sites of varying ages. Salt River, however, with its multi-component (multi-cultural) sites with a rare ceremonial plaza, far surpasses these in importance.

**EARLY
HISTORIC
(1493-1696)**

Neither Virgin Islands National Park nor Buck Island Reef National Monument has Salt River's association with Christopher Columbus (1493) nor the post-Contact events (1509-1525) that affected the relationship of Spanish and Native American peoples in the Antilles, and caused the eclipse of the Carib culture. Salt River was also the focal point of various European attempts (English, Dutch, French, and Knights of Malta) to colonize St. Croix, the largest of the islands, between 1641 and 1665.

**LATE
HISTORIC
(1733-)**

The history of Salt River during the greater part of Danish sovereignty (1733-1917) was one of extensive agricultural development and Transportation systems (maritime trade).

Salt River similarly shares a number of characteristics in the area of natural resources with Virgin Islands National Park and Buck Island Reef National Monument, but distinctions are evident that support claims for Salt River's unique status.

GEOLOGY

The carbonate submarine canyon at Salt River is one of few such features worldwide. It has been professionally considered "an endangered geological formation" because of its rarity and the threat of development in the area. Neither Virgin Islands National Park nor Buck Island Reef National Monument contain such a feature within their boundaries.

CORAL REEFS

While all three areas have coral reef systems that are similar in species composition, the quality of deep water species at Salt River is superior due to nutrient upwelling at the canyon wall. The underlying geological structures of the canyon wall (caverns, grottoes, ledges, and caves), affecting coral growth and attachment are vastly different from anything found in the two NPS units used for comparison.

MANGROVES

Areas containing stands of all three species of mangroves are to be found at Salt River, Virgin Islands National Park, and Buck Island Reef National Monument. The greater Salt River area, however, contains the last remaining and least impacted major mangrove estuarine system in the Virgin Islands.

TERRESTRIAL VEGETATION

The sites under comparison have many terrestrial vegetative traits in common. Salt River is unique to the others due to the close association of its upland terrestrial, estuarine, and open marine environments. This interrelationship presents a continuity of transitions of natural systems within a relatively small geographic area.

MARINE FAUNA

The three areas under comparison are host to endangered species. Only the near-shore deep water environment at the entrance to Salt River Bay encourages the close proximity of migratory and resident endangered species, e.g., humpback whales and bottlenose dolphins.

TERRESTRIAL FAUNA

Salt River compares favorably with Virgin Islands National Park in numbers and species of endangered and threatened birds (resident and migratory). Salt River is one of the most important habitats on St. Croix, providing cover and a large productive feeding ground. Of the three areas under comparison, the presence of the West Indian Whistling Duck (Dendrocygna arborea) and Ospreys (Pandion haliaetus) may be unique to Salt River.

WATERSHED

The landforms of the islands of St. John and St. Croix, Virgin Islands National Park and Salt River respectively have well defined watersheds. Buck Island Reef National Monument, because of its size, has a very limited watershed. Only Salt River, because of the close conjunction and interrelationship of its component systems, can be said to constitute a natural microcosm. Runoff from the Salt River watershed provides nutrients to the estuarine system, including mangroves, and to the open marine environment.

NURSERIES/ FISHERIES

Buck Island Reef has no extensive mangroves open to the sea to foster marine nurseries or fisheries. Virgin Islands National Park and Salt River, however, do feature this system. The primary differences lies, on the one hand, in the number of bays and inlets within Virgin Islands National Park that function as nurseries for larvae and juvenile fish and invertebrates, while Salt River on the other hand constitutes the sole remaining undisturbed area on St. Croix supporting and

nurturing fish and invertebrate populations. This in turn helps replenish fisheries in the island's coral reef environments.

RESEARCH

Salt River, Virgin Islands National Park, and Buck Island Reef National Monument all have well established scientific value, and various types of research have been undertaken in each area. While research at Virgin Islands National Park has benefitted greatly from Biosphere Reserve status, scope and depth has not been as great as at Salt River. The same may be said for Buck Island Reef. At Salt River, the long-term presence, extent, and accessibility of NOAA's National Undersea Research Program has provided a data base on marine biology and geology unprecedented for this type of marine system in the Caribbean region.

It must always be borne in mind that it is the cumulative effect of individual cultural and natural resource significances, all within a rather limited geographic area, that makes Salt River truly unique. No other single location throughout the West Indies has all the attributes and associations that Salt River does.

B. FEASIBILITY

The test of feasibility involves weighing values and public needs served by an alternative.

1. Size/Configuration

Each alternative (except Alternative D-No Action) embraces ample territory required for preservation, interpretation, and administration of its inherent historical, recreational, natural and park values and each would serve the needs of the public and the National Park System. Advantageous units in both size and shape have been proposed to carry out the specific intent of each alternative.

2. Potential for Efficient Administration at Reasonable Costs

a. Acquisition

A detailed analysis of realty values by the NPS Division of Land Resources reveals that Alternatives A, B and C would cost \$2.25 million, \$13.0 million, and \$23.5 million respectively.

It would appear to be advantageous, however, to act swiftly before a major private development gets underway that could escalate land acquisition costs.

There are no acquisition costs associated with the anticipated donation of lands held by the Virgin Island's Government except for those incidental expenses attributable to title, survey services, etc.

b. Development

Development proposed for Alternatives A, B, and C is expected to cost about \$3,370,000, \$11,032,000, and \$11,090,000, respectively. These costs include facilities needed for public recreational uses and administration as well as those needed for interpretation of the human and natural history of the area.

There are certain requirements and general costs that may assist the reader in gaining initial insight into the project. It is anticipated that further archeological study will be required to locate and examine in detail the village/burial sites and to evaluate further their extent and relationships. This study could cost as much as \$200,000, depending upon the level of investigations. All other studies including the General Management Plan, Historic Resource Study, Historic Structures Reports, Historical base maps, and Study of Historic Properties are estimated to cost approximately \$500,000.

c. Operations

Estimated annual operating expenses would range from approximately \$378,000 in Alternative A, to \$624,000 each for Alternatives B and C.

A detailed staffing summary is found in Appendix B.

3. Other Factors

a. Land Ownership/Availability

There appear to be approximately 55 parcels of property (See Appendix D) in the largest alternative (Alternative C). That alternative totals approximately 1,000 acres of land and water. Of this, about 393 acres are land and 607 acres are water. Land records show four parcels held by the Virgin Islands Government amounting to 54.23 acres ($7.93 + 25.36 + 15.94 + 5.00$), or 13.8 percent of the total lands which might be donated for the project. Generally, tracts with high value improvements have been deleted from consideration during this initial planning phase. The Land Protection Plan will consider carefully a number of different alternatives and strategies that would protect the integrity of the park resources.

Upland areas around Salt River Bay are characterized generally by relatively high land values.

The study team did not conduct a survey of owner willingness to sell. Because of the preliminary nature of this report, the complex corporate ownership of some of the holdings, and the possibility of creating landowner apprehension, the team thought it prudent to await further direction before making such contacts. What effects Hurricane Hugo had on landowner's willingness to sell is yet to be determined.

As a part of the planning process, a public meeting was held at the John H. Woodson School on May 10, 1989. Approximately 250 people attended. Of the 33 individuals and groups addressing the subject, only one individual spoke against the park concept. The majority of the speakers indicated that Alternative C with the most acreage was preferred since it contained overall protection of the historical, archeological and natural resources of the Salt River Bay.

During the May 10, 1989, public meeting, a statement was read into the record from the Vice-President and Director of the Caribbean Programs for The Nature Conservancy indicating its offer of "...assistance in acquiring property in the Salt River Estuary that will lead to the establishment of a comprehensive park." It was also indicated, "...the Conservancy will make its Triton Bay Rookery Sanctuary land available as part of this park."

b. Accessibility

Northside Road and North Shore Drive serve the area proposed as a park. Centerline Road from Frederiksted and the Melvin Evans Highway from Alexander Hamilton Airport provide access to the area for cruise ship and air passengers. Taxi service from Christiansted is readily available at reasonable rates. Island taxi rates from point to point are published in tourist information pamphlets. Trip rates for two persons from the airport to downtown

Christiansted are about \$4 each. Two-hour sightseeing tours are available for two persons for \$20. There are a number of car rental firms available on the island that offer jeeps, cars, and scooters. Numerous paved roads offer quick and convenient access to the Columbus Landing Site from all points on the island, which is about 22 miles long and 6 miles wide.

c. Staffing - See Appendix B.

d. Development Requirements - See Appendix A.

e. Adaptability of Land Resources

The land and water resources are well suited to interpretive, educational, and scientific use. Because of man's previous impact on the area, some of the use is projected for those areas already altered or disturbed. The visitor center facilities envisioned for development on the east side of the bay could use the manmade terraces on the hilltop overlooking the ocean and bay. Well designed, environmentally sound construction will contribute greatly to blending these structures into the hillsides to minimize visual and aesthetic impacts.

The already disturbed, manmade areas of Cape of the Arrows could be adapted for public picnicking and camping sites that could help ease the pressures on the Columbus Landing Site.

Included in all three alternatives are the forts and archeological sites. The fort sites, after appropriate stabilization techniques have been accomplished, will be a focal point in the development of the park. Archeological investigations are readily adaptable to onsite interpretation by professional archeologists under the rather mild year-round island temperatures. Section 106 provisions and implications would need to be addressed before any alterations to the structures or the land take place for development or interpretive purposes.

f. Visitation Potential

Salt River Bay has the potential for offering the visitor unique opportunities with regard to Pre-Columbian and Columbian associations on the island. The historic sites, museum and exhibits are expected to be strong magnets attracting visitors to the area.

The bay also offers the visitor as well as the islander an opportunity for study and recreational pleasure, particularly activities of passive recreation, associated with nature study. There are few other large, year-round protected bays that provide such diversity of natural resources on the island.

It is estimated that there were 128,200 visits to Christiansted National Historic Site in 1988 and 95,100 visits to nearby Buck Island Reef National Monument. The visits for the 4-year period of 1985-88, are as follows:

	<u>Christiansted</u>	<u>Buck Island Reef</u>
1985:	133,600	62,300
1986:	196,100	74,700
1987:	125,300	93,000
1988:	128,200	95,100

Visitation potential for a Salt River Park might be compared with that of Christiansted.

g. Relationship to the Economy

Tourism is the dominant economic activity in the U.S. Virgin Islands. The freeport shopping, the scenery, water sports, historical and natural sites, and national parks on St. John and St. Croix offer visitors and residents more than sun, sand, and sea.

Establishment of a park would have both direct and indirect benefits to the island's economy. Substantial portions of the park's budget would be spent in the local community. Additional tourism, through an expanded stay, can also be expected to provide additional revenue. S. B. Jones-Hendrickson (1989) stated, "St. Croix is now undergoing massive development. It is a development that is welcomed...." He further states, "As the development takes place, the perception and reality of declining space is central to the debate of where will the country be going and where will the people go to get access to open spaces. This is why it is critical that as development of buildings occur, there should also be companion development of open space."

Jones-Hendrickson points out that, "Outdoors and an open space are a solid companion to tourism."

There could be between \$378,000 to \$624,000 in staffing and other operating costs for the proposed park. The bulk of these funds would be spent on the island. A new park would create between 12 and 18 new jobs.

h. Public Interest and Support

Contacts made during the study period indicate that there is considerable support for the creation of a Salt River/ Columbus Landing Site Park. In contrast, opposition to the project has been recognized from development interests. Likewise, opposition to the project can be anticipated from some landowners.

Letters of support, statements and comments have been received from numerous individuals and organizations. Newspaper editorials and articles have given an abundance of publicity, both pro and con, to the project.

i. Integrity

The area retains an inviting, intimate character, although evidence of man's impact on the land is plainly visible around the highlands surrounding the bay.

The outstanding cultural and natural resources of the site, together with its significance as the only known Columbus associated site on the U.S. soil, has merit as a proposed territorial park or unit of the National Park System.

Previous development, primarily dredge and fill operations, some uncontrolled artifact collecting, and potential pollution from upstream housing developments have had an impact upon some of the area's natural and cultural values. However, the impact of man's activities upon the area and its ecosystems has not been so extensive that it makes the area unsuitable for a park. There is, however, the threat of loss of integrity if the proposed private development is constructed. Should the development occur, a reevaluation would need to be made to determine if some parts of the study area would remain as a feasible unit.

CONSULTATION AND COORDINATION

Local agencies and individuals were consulted in the development of the plan.

Government agencies consulted included:

Florence Williams Public Library
NOAA Underseas Research Laboratory
U.S. Coast Guard Auxiliary
U.S. Department of Agriculture, Soil Conservation Service
U.S. Department of Commerce, National Marine Fisheries Service
U.S. Department of Commerce, Marine Sanctuary Program
U.S. Department of Interior, Fish and Wildlife Service
U.S. Department of Interior, National Park Service
Virgin Islands Office of the Delegate to Congress Ron de Lugo
Virgin Islands Office of the Administrator for St. Croix
Virgin Islands Department of Housing, Parks and Recreation
Virgin Islands Division of Archeology
Virgin Islands Division of Environmental Protection

Virgin Islands Division of Fish and Wildlife
Virgin Islands Department of Planning and Natural Resources
Virgin Islands Office of Economic Development and Agric.
Virgin Islands Senator Virdin C. Brown
Virgin Islands Senator Alicia "Chucky" Hansen
Virgin Islands Senator Edgar M. Iles
Former Virgin Islands Senator Kenneth Mapp
Virgin Islands Senator Robert O'Connor, Jr.
Virgin Islands Senator Holland L. Redfield, III
Virgin Islands Senator Elmo S. Roebuck
Virgin Islands Senator Bingley G. Richardson, Sr.
Virgin Islands Senator St. Claire Williams
Virgin Islands University Cooperative Extension Service
Virgin Islands University Caribbean Research Institute
Virgin Islands University Department of Sociology

Private organizations and individuals consulted included:

Bioimpacts Corporation
Christopher Columbus Jubilee Committee
Environmental Association of St. John & St. Thomas
Island Conservation Effort
Island Resources Foundation
Judith's Fancy Homeowners Association
National Parks and Conservation Association
National Wildlife Federation
The Nature Conservancy
Rare Animal Relief Effort
Rotary Club, St. Croix Central
Rotary Club, St. Croix East
Rotary Club, St. Croix West
Salt River Marina
Sierra Club Defense Fund
West Indies Laboratory of Fairleigh Dickinson Univ.

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APPENDICIES

COLUMBUS LANDING SITE
ST. CROIX, U.S. VIRGIN ISLANDS

ALTERNATIVES STUDY and
ENVIRONMENTAL ASSESSMENT

APPENDIX A

DEVELOPMENT COSTS

ALTERNATIVE A

(COLUMBUS LANDING SITE UNIT)

Entrance Road - 2125 linear feet @ 22-feet wide	\$302,000
Visitor Parking - 60 cars with bus pick-up/drop-off	120,000
with shade structure	50,000
Beach/Parking - 20 cars	40,000
Chemical Toilets (1 building, 1 vault)	40,000
Information/Orientation Station - 2,500 square foot @ \$300 square feet	750,000
Maintenance Facility - 800 Square Feet @ \$175/Square Foot	140,000
Trails - 2,000 linear feet @ 6-feet wide, paved	40,000
Wayside Exhibits - 2	6,000
Revegetation/Forest Stabilization - 4 acres	40,000
Landscaping and Misc. Site Development - 15% of Bldg.	112,000
Cistern-Water	350,000
Signs - Entrance	30,000
Information/Directional	10,000
Utilities - Power Hookup (Underground)/Tele.	30,000
Septic System	<u>100,000</u>
Net Construction Cost	\$2,160,000
Gross Amounts (+56%)	\$3,370,000

For other costs relating to surveys, documentation of cultural resources and archeological monitoring, see Feasibility, Item 2b.

DEVELOPMENT COSTS

ALTERNATIVE B

(CAPE OF THE ARROWS UNIT)

Entrance Road - 8,400 lin. Ft. @ 22' Wide	\$1,193,000
Campground/Picnic Area Road - 1,700 lin. Ft. @ 22' Wide	242,000
Maintenance Area Road - 300 lin. Ft., 22' Wide	43,000
Visitor Center Parking - 100 cars with bus pickup/ dropoff, with shade structure	200,000 50,000
Visitor Center/Museum - 5,000 sq. ft, @ \$300 sq. ft.	1,500,000
Trailhead Parking - 35 cars	70,000
Campground - 10 sites with vehicle access	25,000
Chemical Toilets (1 building, 1 vault)	40,000
Picnic Sites - 50 sites	50,000
Group shelter-2, @ 1,200 sq. ft. each	150,000
Chemical Toilets-2	80,000
Bathhouses - 2 @ 400 sq. ft. each	100,000
Trails - 11,750 lin. ft.	95,000
Maintenance Building - 1,500 sq. ft., storage yard and fencing	350,000
Revegetation/Forest Stabilization - 10 acres	100,000
Landscaping and Misc. Site Development-15% of bldgs.	315,000
Wayside Exhibits - 10	30,000
Overlook - 1 - 350 sq. ft.	15,000
Signs - Entrance-2	50,000
Info/Directional	12,000
Cistern	750,000
Fencing - 4,250 lin ft.	94,000
Employee Residences	150,000
Utilities - Power Hookup (Underground)/Tele.	50,000
Sewage-2 fields	<u>200,000</u>
Net Construction Costs (Cape of the Arrows Unit)	\$5,954,000
Net Construction Costs (Columbus Landing Site Unit)	<u>1,118,000</u>
	\$7,072,000
Gross Amounts (+56%) RD	\$11,032,000

DEVELOPMENT COSTS
ALTERNATIVE B

(COLUMBUS LANDING SITE UNIT)

Entrance Road - 2125 Lin. Ft. @ 22' Wide	\$ 302,000
Visitor Parking - 60 cars with bus pick-up/drop-off	120,000
With shade structure	50,000
Beach/Parking - 20 cars	40,000
Chemical Toilets (1 building, 1 vault)	40,000
Information/Orientation Station - 625 sq. ft.	188,000
@ \$300 sq. ft.	
Trails - 2,000 lin. ft. @ 6' wide, paved	40,000
Wayside Exhibits - 2	6,000
Revegetation/Forest Stabilization - 4 acres	40,000
Landscaping and Misc. Site Development - 15% of Bldg.	28,000
Cistern-Water	94,000
Signs - Entrance	30,000
Information/Directional	10,000
Utilities - Power Hookup (Underground)/Tele.	30,000
Septic System	<u>100,000</u>
Net Construction Cost	\$1,118,000

DEVELOPMENT COSTS

ALTERNATIVE C

Same as Alternative B with addition of:

KIOSK - Intersection North Shore and Northside Roads	\$ 37,000
Net--Alternative B	\$7,072,000
	<hr/>
Net Construction Cost	\$7,109,000
Gross Amounts (+56%) RD	\$11,090,000

APPENDIX B

STAFFING

Proposed SALT RIVER COLUMBUS LANDING SITE

ALTERNATIVE A

	<u>FTE</u>	<u>Cost/Benefits**</u>
Supervisory Park Ranger, GS-025-9/4 *(27,177)	1	37,368
Park Ranger, GS-025-7/4 *(22,214)	1	30,544
Park Ranger, GS-025-5/4 (17,937 X 3)	3	67,264
Admin. Technician, GS-303-7/4 (22,214)	1	27,768
Clerk Typist, GS-303-3/4 (14,281)	1	17,851
Maint. Mech. Foreman, WS-4749-05/2 (12.75P.H.)	1	33,150
Maintenance Worker, WG-4749-05/2 (8.88P.H.)	1	23,088
Tractor Operator, WG-5705-06/2 (9.39P.H.)	1	24,414
Laborer, WG-3502-03/2 (7.98P.H.)	2	41,495
	<hr/>	<hr/>
TOTAL	12	302,942
	RD	303,000

*COLA projected @ 12.5%

**Salary +25%

STAFFING

Proposed SALT RIVER COLUMBUS LANDING SITE

ALTERNATIVES B & C

	<u>FTE</u>	<u>Cost/Benefits**</u>
Chief, I&RM, GS-025-11/4 *(32,879)	1	45,209
Supervisory Park Ranger, GS-025-9/4 *(27,177)	1	37,368
Park Ranger, GS-025-7/4 *(22,214)	1	30,544
Park Ranger, GS-025-5/4 (17,937 X 5)	5	112,106
Museum Specialist, GS-1016-9/4 *(27,177)	1	37,368
Admin. Technician, GS-303-7/4 (22,214)	1	27,768
Clerk-Typist, GS-303-3/4 (14,281)	1	17,851
Maint. Mech. Foreman, WS-4749-05/2 (12.75P.H.)	1	33,150
Maintenance Worker, WG-4749-05/2 (8.88P.H.)	1	23,088
Tractor Operator, WG-5705-06/2 (9.39P.H.)	1	24,414
Laborer, WG-3502-03/2 (7.98P.H.)	3	62,243
Motor Vehicle Opr., WG-5703-05/2 (8.88P.H.)	1	23,088
TOTAL	18	474,197
	RD	474,000

*COLA projected @ 12.5%

**Salary +25%

APPENDIX C

SUMMARY OF OPERATING COSTS

RECURRING

	Alt. A	Alt. B	Alt. C
Staffing	303,000	474,000	474,000
Supplies, Equipment, Vehicle Rental, etc.	<u>75,000</u>	<u>150,000</u>	<u>150,000</u>
	378,000	624,000	624,000

NON-RECURRING COSTS

Demolition, Site Cleanup, Gates, Barriers	<u>100,000</u>	<u>350,000</u>	<u>350,000</u>
	478,000	974,000	974,000

APPENDIX D

SALT RIVER STU

ESTATE SALT F

ESTATE SALT RIVER					
LOT	NAME	ACREAGE	LOT	NAME	ACREAGE
1	LICA HOLDING CORP.	2.15	39	PENDER, JANET W. AND BOYCE	1.15
1A	LICA HOLDING CORP.	1.66	40	SHITTA, WILLIAM W.	1.82
2	LICA HOLDING CORP.	0.08	41	PICKES, ROBERT E. AND SUN M.	1.04
3	GOVERNMENT OF THE U. S.	3.00	42	PICKES, ROBERT E. AND SUN M.	1.08
4	LICA HOLDING CORP.	1.44	43	PICKES, ROBERT E. AND SUN M.	1.22
5	LICA HOLDING CORP.	1.27	44	KRAMPTON, PETER M. AND JOAN D.	1.08
6	LICA HOLDING CORP.	0.87	45	KRAMPTON, PETER M. AND JOAN D.	0.84
7	LICA HOLDING CORP.	0.87	46	KRAMPTON, PETER M. AND JOAN D.	0.84
8	LICA HOLDING CORP.	1.31	47	KRAMPTON, PETER M. AND JOAN D.	1.48
9	LICA HOLDING CORP.	1.88	48	BURG, JOHN T. AND JOAN L.	1.15
10	LICA HOLDING CORP.	1.10	49	OLSEN, ANDRES A. AND ERIKSEN, A.	1.08
11	BATURARY, SUSAN AND OMAR	0.88	50	THOMAS, ERIK	0.78
12	RYAN, JACK AND MARCY	0.74	51	JOHNSTON, DANIEL E. AND ANNE G.	1.09
13	AURON, THOMAS ET AL	0.80	52	GAFFNEY, RICHARD L. AND PAMELA S.	1.00
14	MOULDER, SALVATOR	0.80	53	GONZALES, WILLY	1.00
15	KRAMPTON, PETER M. AND JOAN D.	0.74	54	HODGE, PROSPER	0.70
16	KRAMPTON, PETER M. AND JOAN D.	0.65	55	BAUGH, PAMELA	0.82
17	SALT RIVER PROPERTIES	0.82	56	FOX, B. JAMES H. AND HUBBARD A.	1.07
18	SALT RIVER PROPERTIES	0.58	57	STEGELT, RANDALL A.	0.82
19	SALT RIVER PROPERTIES	0.58	58	MOORE, MALCOLM	0.89
20	SALT RIVER PROPERTIES	0.58	59	MYERS, CHARLES R. AND MELISSA	0.63
21	SALT RIVER PROPERTIES	0.57	60	HOMESSET, DAVID AND FRANCES G.	1.20
22	SALT RIVER PROPERTIES	0.52	61	SUNDGLAD, D.E. V.	0.82
23	DOYER, CHARLES	0.71	62	SHREVE, WALLACE M. AND SOMME M.	0.78
24	RYAN, PETER	0.73	63	BURG, HARRY F. AND JACQUELINE	0.84
25	KRAMPTON, PETER M. AND JOAN D.	0.85	64	BAUGH, PAMELA R.	0.72
26	KRAMPTON, PETER M. AND JOAN D.	0.90			
27	KRAMPTON, PETER M. AND JOAN D.	1.03			

ESTATE MORNINGSTAR		
LOT	NAME	ACREAGE
2	THOMAS, KAY TAGGART	0.77
2A	LICA HOLDING CORP.	0.28
2B	LICA HOLDING CORP.	0.08
3	THOMAS, KAY TAGGART	0.72
3A	THOMAS, KAY TAGGART	0.46
3B	LICA HOLDING CORP.	0.40
5	THOMAS, KAY TAGGART	5.82
5B	LICA HOLDING CORP.	0.36
22	NEWKIRK, WILLIAM W. AND ANABEL A.	2.80
23	NEWKIRK, WILLIAM W. AND ANABEL A.	0.26
24	VIRGIN TRADE WINDS	2.66
25	VIRGIN TRADE WINDS	0.23
30	RYAN, HELEN E.	0.58
31	RYAN, HELEN E.	0.18
33	COLUMBUS BAY MARINA, LTD.	49.44

ESTATE CONCORDIA		
LOT	NAME	ACREAGE
PT. 46	UNKNOWN OWNER	7.90

ESTATE CONCORDIA

PROPERTY MAP

AREA

ESTATE JUDITH'S FANCY		
LOT	NAME	ACREAGE
326	REGAL CONSULTING, ET AL	38.34
327	REGAL CONSULTING, ET AL	10.15
329	REGAL CONSULTING, ET AL	2.89
330	MOSELEY, THOMAS J.	1.02
343	REGAL CONSULTING, ET AL	17.53
345	KILBRIDE, HERMINIA	0.50
346	KILBRIDE, HERMINIA	0.08

ESTATE ST. JOHN		
LOT	NAME	ACREAGE
4	Government of the V. L.	7.93
37	Government of the V. L.	25.36
78	Government of the V. L.	75.94

ESTATE MONTPELIER		
LOT	NAME	ACREAGE
1	ANDERSON, ROBERT W.	2.98
7A	ANDERSON, ROBERT W.	1.00
74	COLUMBUS BAY MARINA, LTD.	57.04
148	OOT, EARL L., ET AL	15.50
15	DYCK, MANFRED F. AND URSULA W.	51.82
15A	NATURE CONSERVANCY	10.42
16	MILLAR, DOUGLAS	0.56
36	DYCK, MANFRED F. AND URSULA W.	1.00
39	HOLCOMBE, MICHAEL E., TRUSTEE	1.01
41	DYCK, MANFRED F. AND URSULA W.	0.98
42	DYCK, MANFRED F. AND URSULA W.	4.01

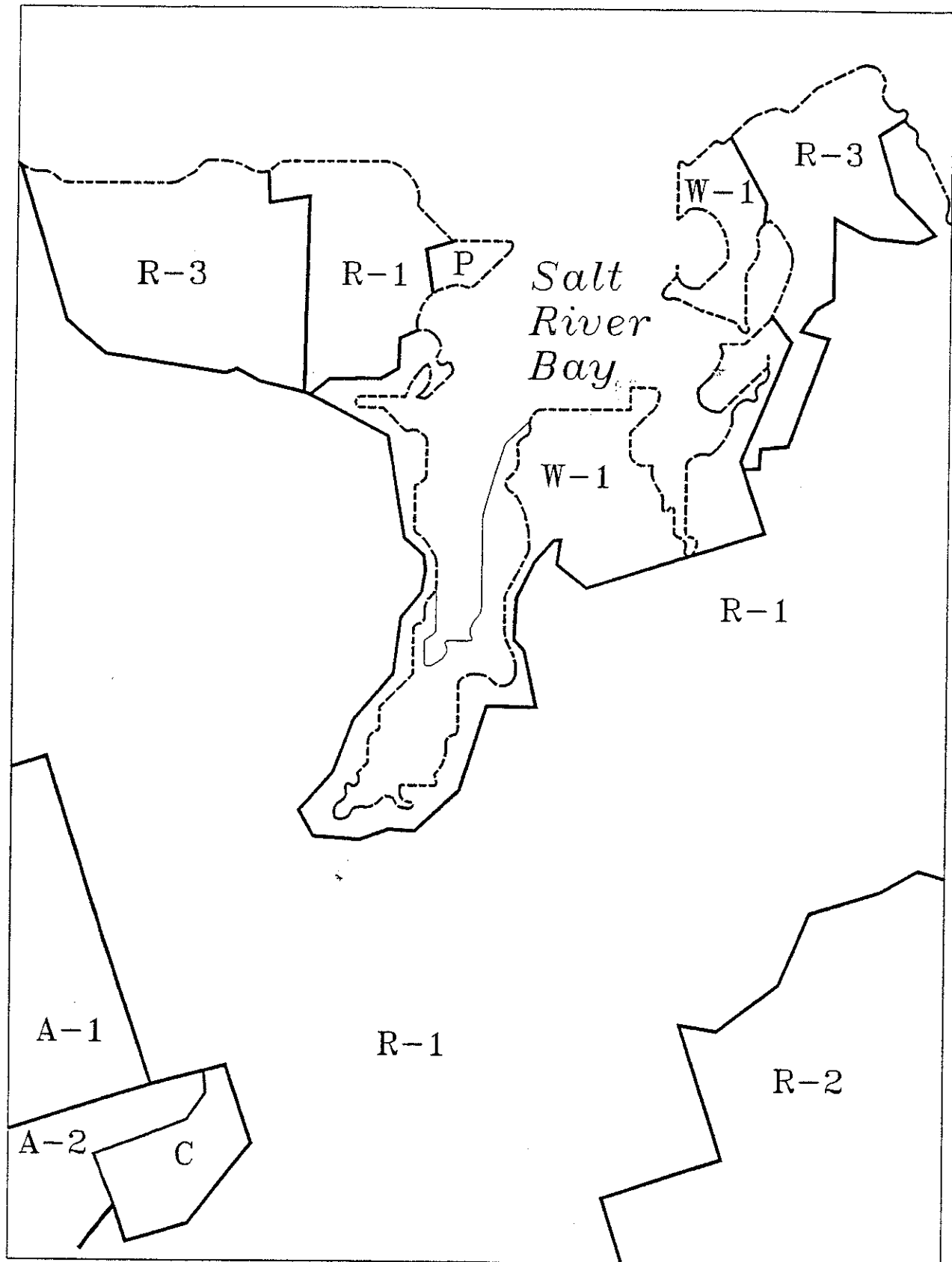
GRAPHIC SCALE

(IN FEET)
1 inch = 500 ft.

APPENDIX E

A-1&2 AGRICULTURAL
R-1&2 RESIDENCE - LOW DENSITY
R-3 RESIDENCE - MEDIUM DENSITY

P- PUBLIC
W-1 WATERFRONT - PLEASURE
C- COMMERCIAL



FIGURE

SALT RIVER BAY AREA ZONING MAP

APPENDIX F -- FAUNA

AVIFAUNA

<u>FAMILY</u>	<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>
PODICIPEDIDAE			
	<u>Podilymbus podiceps</u>	Pied-billed grebe	W/S
PROCELLARIIDAE			
	<u>Puffinus Iherminieri</u>	Audubon's Shearwater	-
HYDROBATIDAE			
	<u>Oceanites oceanicus</u>	Wilson's storm-petrel	-
	<u>Oceanodroma leucorhoa</u>	Leach's storm-petrel	-
PHAETHONTIDAE			
	<u>Phaethon lepturus</u>	White-tailed tropicbird	L
PELECANIDAE			
	<u>Pelecanus occidentalis</u>	Brown pelican	R/S
SULIDAE			
	<u>Sula leucogaster</u>	Brown booby	S
FREGATIDAE			
	<u>Fregata magnificens</u>	Magnificent Frigatebird	S
ARDEIDAE			
	<u>Ardea herodias</u>	Great blue heron	L/S
	<u>Nycticorax nycticorax</u>	Black-crowned night heron	L/S
	<u>Nyctanassa violaceus</u>	Yellow-crowned night heron	S
	<u>Butorides striatus</u>	Green-backed heron	W
	<u>Casmerodius albus</u>	Great egret	L/S
	<u>Egretta thula</u>	Snowy egret	L/S
	<u>Egretta tricolor</u>	Tricolored heron	-
	<u>Egretta caerulea</u>	Little blue heron	S
	<u>Bubulcus ibis</u>	Cattle egret	S
ANATIDAE			
	<u>Anas bahamensis</u>	White-cheeked pintail	L
	<u>Anas platyrhynchos</u>	Mallard	-
	<u>Anas crecca</u>	Green-winged teal	L
	<u>Anas discors</u>	Blue-winged teal	-
	<u>Anas americana</u>	American wigeon	L
	<u>Anas clypeata</u>	Northern shoveler	L
	<u>Anas cyanoptera</u>	Cinnamon teal	-
	<u>Anas acuta</u>	Northern pintail	L
	<u>Aythya collaris</u>	Ring-necked duck	L
	<u>Aythya affinis</u>	Lesser scaup	-
	<u>Aythya marila</u>	Greater scaup	-
	<u>Oxyura jamaicensis</u>	Ruddy duck	L
	<u>Dendrocygna bicolor</u>	Fulvous whistling duck	-
ACCIPITRIDAE			
	<u>Buteo jamaicensis</u>	Red-tailed hawk	S
	<u>Circus cyaneus</u>	Northern harrier	-
PANDIONIDAE			
	<u>Pandion haliaetus</u>	Osprey	L/S
FALCONIDAE			
	<u>Falco columbarius</u>	Merlin	-
	<u>Falco peregrinus</u>	Peregrin falcon	R
	<u>Falco sparverius</u>	American kestrel	-

PHASIANIDAE			
	<u>Colinus virginianus</u>	Northern bobwhite	-
RALLIDAE			
	<u>Porzana carolina</u>	Sora	-
	<u>Gallinula chloropus</u>	Common moorhen	-
	<u>Rallus longirostris</u>	Clapper rail	-
	<u>Fulica caribaea</u>	Caribbean coot	-
	<u>Fulica americana</u>	American coot	-
CHARADRIIDAE			
	<u>Charadrius semipalmatus</u>	Semipalmated plover	-
	<u>Charadrius wilsonia</u>	Wilson's plover	-
	<u>Charadrius vociferus</u>	Killdeer	-
	<u>Pluvialis squatarola</u>	Black-bellied plover	S
	<u>Pluvialis dominica</u>	Lesser golden plover	-
HAEMATOPODIDAE			
	<u>Haematopus palliatus</u>	American oystercatcher	L/S
RECURVIROSTRIDAE			
	<u>Himantopus himantopus</u>	Black-necked stilt	S
SCOLOPACIDAE			
	<u>Numenius phaeopus</u>	Whimbrel	L
	<u>Tringa melanoleuca</u>	Greater yellowlegs	S
	<u>Tringa flavipes</u>	Lesser yellowlegs	S
	<u>Tringa solitaria</u>	Solitary sandpiper	-
	<u>Actitis macularia</u>	Spotted sandpiper	W
	<u>Arenaria interpres</u>	Ruddy turnstone	-
	<u>Limnodromus griseus</u>	Short-billed dowitcher	-
	<u>Calidris pusilla</u>	Semipalmated sandpiper	-
	<u>Calidris minutilla</u>	Least sandpiper	W
	<u>Calidris alba</u>	Sanderling	S
	<u>Calidris mauri</u>	Western sandpiper	-
	<u>Calidris melanotos</u>	Pectoral sandpiper	-
	<u>Calidris fuscicollis</u>	White-rumped sandpiper	-
	<u>Calidris canutus</u>	Red knot	-
	<u>Calidris bairdii</u>	Baird's sandpiper	-
	<u>Calidris himantopus</u>	Stilt sandpiper	-
	<u>Gallinago gallinago</u>	Common snipe	-
	<u>Bartramia longicauda</u>	Upland sandpiper	-
	<u>Tryngites subruficollis</u>	Buff-breasted sandpiper	-
	<u>Phalaropus tricolor</u>	Wilson's phalarope	-
	<u>Catoptrophorus semipalmatus</u>	Willet	L
LARIDAE			
	<u>Larus atricilla</u>	Laughing gull	S
	<u>Larus argentatus</u>	Herring gull	-
	<u>Sterna antillarum</u>	Least tern	L/S
	<u>Sterna sandvicensis</u>	Sandwich tern	L
	<u>Sterna dougallii</u>	Roseate tern	L
	<u>Sterna hirundo</u>	Common tern	L
	<u>Sterna anaethetus</u>	Bridled tern	-
	<u>Sterna fuscata</u>	Sooty tern	-
	<u>Sterna maximus</u>	Royal tern	L
	<u>Sterna nilotica</u>	Gull-billed tern	-
	<u>Anous stolidus</u>	Brown noddy	-

COLUMBIDAE

<u>Zenaida aurita</u>	Zenaida dove	W/S
<u>Columba squamosa</u>	Scaly-naped pigeon	W/S
<u>Columba leucocephala</u>	White-crowned pigeon	L/W
<u>Columbina passerina</u>	Common ground-dove	W/S
<u>Geotrygon mystacea</u>	Bridled quail-dove	L

CUCULIDAE

<u>Crotophaga ani</u>	Smooth-billed ani	S
<u>Coccyzus minor</u>	Mangrove cuckoo	W
<u>Coccyzus americanus</u>	Yellow-billed cuckoo	W

TROCHILIDAE

<u>Eulampis holosericeus</u>	Green-throated carib	W/S
<u>Orthorhyncus cristatus</u>	Antillean crested hummingbird	W/S

ALCEDINIDAE

<u>Ceryle alcyon</u>	Belted kingfisher	W
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PICIDAE

<u>Sphyrapicus varius</u>	Yellow-bellied sapsucker	-
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TYRANNIDAE

<u>Tyrannus dominicensis</u>	Gray kingbird	W/S
<u>Elaenia martinica</u>	Caribbean elaenia	W

HIRUNDINIDAE

<u>Progne dominicensis</u>	Caribbean martin	-
<u>Hirundo rustica</u>	Barn swallow	-
<u>Riparia riparia</u>	Bank swallow	-
<u>Hirundo pyrrhonota</u>	Cliff swallow	-

MIMIDAE

<u>Mimus polyglottos</u>	Northern mockingbird	W
<u>Margarops fuscatus</u>	Pearly-eyed thrasher	W/S

VIREONIDAE

<u>Vireo altiloquus</u>	Black-whiskered vireo	W
<u>Vireo flavifrons</u>	Yellow-throated vireo	W

EMBERIZIDAE

<u>Dendroica coronata</u>	Yellow-rumped warbler	W
<u>Dendroica magnolia</u>	Magnolia warbler	W
<u>Dendroica petechia</u>	Yellow warbler	W/S
<u>Dendroica palmarum</u>	Palm warbler	-
<u>Dendroica striata</u>	Blackpoll warbler	W/S
<u>Dendroica tigrina</u>	Cape May warbler	W/S
<u>Dendroica discolor</u>	Prairie warbler	W/S
<u>Mniotilta varia</u>	Black-and-white warbler	W/S
<u>Setophaga ruticilla</u>	American redstart	W
<u>Protonotaria citrea</u>	Prothonotary warbler	-
<u>Helminthophila vermivorus</u>	Worm-eating warbler	W
<u>Seiurus aurocapillus</u>	Ovenbird	W
<u>Seiurus noveboracensis</u>	Northern waterthrush	W
<u>Geothlypis trichas</u>	Common yellowthroat	W/S
<u>Parula americana</u>	Northern parula	W
<u>Wilsonia citrina</u>	Hooded warbler	W
<u>Vermivora pina</u>	Blue-winged warbler	W
<u>Coereba flaveola</u>	Banquit	W/S
<u>Tiaris bicolor</u>	Black-faced grassquit	W/S

AMPHIBIANS

<u>FAMILY</u>	<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>
LEPTODACTYLIDAE	<u>Eleutherodactylus lentus</u>	Mute frog	-
	<u>Eleutherodactylus coqui</u>	Common coqui	-
	<u>Eleutherodactylus antillensis</u>	Antillean frog	-
	<u>Leptodactylus albilabris</u>	White-lipped frog	-
BUFONIDAE	<u>Bufo marinus</u>	Marine toad	S

REPTILES

GEKKONIDAE	<u>Sphaerodactylus macrolepis</u>	Dwarf gecko	S
	<u>Hemidactylus mabouia</u>	Woodslave	-
	<u>Thecadactylus rapicauda</u>	Giant woodslave	S
IGUANIDAE	<u>Anolis acutus</u>	Tree lizard	S
CHELONIIDAE	<u>Chelonia mydas</u>	Green turtle	R/S
	<u>Eretmochelys imbricata</u>	Hawksbill	R/S
	<u>Dermochelys coriacea</u>	Leatherback	R/S
	<u>Caretta caretta</u>	Loggerhead	R/S
BOIDAE	<u>Epicrates monensis granti</u>	Boa	R/S

INVERTEBRATES

CRUSTACEA	<u>Coenobita clypeatus</u>	Soldier crab	S
BRACHYURA	<u>Grapsus sp.</u>	Rock crabs	S
	<u>Cardisoma guanhumi</u>	Land crabs	S
	<u>Gecracinus sp.</u>	Coconut crab	-
	<u>Ocypoda sp.(p.)</u>	Ghost crab	S
	<u>Uca pugnax rapax</u>	Fiddler crab	S

MAMMALS

<u>FAMILY</u>	<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>
NOCTILLIONIDAE			
	<u>Noctilio leporinus</u>	Fisherman bat	R
PHYLLOSTOMATIDE			
	<u>Artibeus jamaicensis</u>	Fruit bat	-
	<u>Brachyphylla cavernarum</u>	Cave bat	R
MURIDAE			
	<u>Rattus norvegicus</u>	Norway rat	S
	<u>Mus musculus</u>	House mouse	S
	<u>Rattus rattus frugivorus</u>	Black rat	S
MOLOSSIDAE			
	<u>Molossus molossus</u>	Velvety free-tailed bat	-
VIVERRIDAE			
	<u>Herpestes auropunctatus</u>	Mongoose	S
CERVIDAE			
	<u>Odocoileus virginianus</u>	White-tailed deer	S
BOS			
	<u>Bos brachyceros x primigenius</u>	Senepol cattle	S
EQUIDAE			
	<u>Equus caballus</u>	Horse	S
CANIDAE			
	<u>Canis familiaris</u>	Dog	S
FELIDAE			
	<u>Felis catus</u>	Cat	S
PHYSETERIDAE			
	<u>Physeter catodon</u>	Sperm whale	R/S
BALAENOPERIDAE			
	<u>Megaptera novaeangliae</u>	Humpback whale	R/S
	<u>Balaenoptera physalus</u>	Finback whale	R/S
	<u>Baleanoptera borealis</u>	Sei whale	R/S

KEY TO STATUS

- = POSSIBLE RESIDENT OR MIGRANT
- S = SEEN DURING TRANSECTS
- R = RARE SPECIES
- L = LOCALLY THREATENED SPECIES (SLADEN, 1988)
- W = WAUER AND SLADEN, 1988

APPENDIX G

SUGAR BAY MANGROVE BIRD COUNT DATA
(Wauer and Sladen, 1988)

<u>SPECIES</u>	<u>DATES AND NUMBERS RECORDED</u>											
	<u>*1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
Green-backed heron <u>Butorides straitus</u>				2	2	1	2	1		2	3	
Spotted sandpiper <u>Actitis macularia</u>			1	2		1		1			1	
Least sandpiper <u>Calidris minutilla</u>						2						
Scaly-naped pigeon <u>Columba squamosa</u>		6	7	10	6	12	8	7	4	5	3	4
White-crowned pigeon <u>Columba leucocephala</u>								3		4	5	
Zenaida dove <u>Zenaida aurita</u>		3	5	4	5	6	2	4		5	5	3
Common ground-dove <u>Columbina passerina</u>								2				2
Yellow-billed cuckoo <u>Coccyzus americanus</u>						1						
Mangrove cuckoo <u>Coccyzus minor</u>						1	1	1		2	2	2
Green-throated carib <u>Eulampis holosericeus</u>		3				2	2	1	2	2	1	
Ant. crested hummingbird <u>Orthorhynchus cristatus</u>		2	3	2		2	1	3	2	3	3	2
Belted kingfisher <u>Ceryle alcyon</u>			1	1	1	1						
Caribbean Eleania <u>Elaenia martinica</u>	2	3	2	5	4	3	5	4	4	3	6	4
Gray kingbird <u>Tyranus dominicensis</u>	4	3	5	4	5	4	3	4	2	4	4	4
Northern mockingbird <u>Mimus polyglottos</u>							1					

Pearly-eyed thrasher <u>Margarops fuscatus</u>	4	8	10	8	10	10	8	6	8	6	6	8
Yellow-throated vireo <u>Vireo falvifrons</u>							1		1			
Black-whiskered vireo <u>Vireo altiloquus</u>		1	1	2		2	1		1	2	2	3
Blue-winged warbler <u>Vermivora pinus</u>		1		1		2						
Northern parula <u>Parula americana</u>		3	9	16	8	5	2	8	4	3	3	5
Yellow warbler <u>Dendroica petechia</u>	8	25	25	32	25	9	12	12	4	6	8	20
Magnolia warbler <u>Dendroica magnolia</u>									1			1
Cape May warbler <u>Dendroica tigrina</u>			2	2	3		1		1	2		1
Yellow-rumped warbler <u>Dendroica coronata</u>			1									
Prairie warbler <u>Dendroica discolor</u>		2	1	2		3	1	4			1	
Blackpoll warbler <u>Dendroica striata</u>		1	3	1								
Black-and-white warbler <u>Mniotilta varia</u>		16	5	12	6	7	1	8	5	5	1	5
American redstart <u>Setophaga ruticilla</u>	1	8	6	8	4	7	3		3	3	1	1
Worm-eating warbler <u>Helminthos vermivorus</u>		1	1	1	1	2	1	1		1	1	
Ovenbird <u>Seiurus aurocapillus</u>				1	1	1					1	
Northern waterthrush <u>Seiurus noveboracensis</u>	10	20	15	26	25	21	15	6	2	6	8	8
Common yellowthroat <u>Geothlypis trichas</u>						1	1	1	1	1		1

Hooded warbler <u>Wilsonia citrina</u>	1	1	1		3					1		
Bananaquit <u>Coereba flaveola</u>	6	12	16	10	15	18	12	5	8	8	6	7
Black-faced grassquit <u>Tiaris bicolor</u>	4	4	7	8	7	10	6	6			5	4
Individual Totals	39	123	127	161	128	137	90	88	53	73	77	85
Species Totals (35)	(8)	(20)	(22)	(24)	(17)	(27)	(23)	(26)	(17)	(20)	(23)	(19)

*Dates: 1 = Oct. 1
2 = Oct. 8
3 = Oct. 25
4 = Oct. 26
5 = Nov. 1
6 = Nov. 15
7 = Nov. 27
8 = Dec. 6
9 = Dec. 14
10 = Jan. 11
11 = Feb. 14
12 = Mar. 31

APPENDIX H

FISHES SEEN DURING VISITS TO SALT RIVER

<u>FAMILY</u>	<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>HABITAT</u>	<u>ABUNDANCE</u>
ORECTOLOBIDAE - CARPET SHARKS	<u>Ginglymostoma cirratum</u>	Nurse shark	R W	C
CARCHARHINIDAE - REQUIEM SHARKS	<u>Carcharhinus leucas</u>	Bull shark	O W	OC
	<u>Carcharhinus limbatus</u>	Blacktip shark	O W	OC
SPHYRNIDAE - HAMMERHEAD SHARKS	<u>Sphyrna mokarran</u>	Great Hammerhead	O W	OC
DASYATIDAE - STINGRAYS	<u>Dayyatis americana</u>	Southern stingray	B S	C
MYLITOBATIDAE - EAGLE RAYS	<u>Aetobatus narinari</u>	Spotted eagle ray	R S	OC
ELOPIDAE - TARPONS	<u>Elops saurus</u>	Lady fish	B S	C
	<u>Megalops atlanticas</u>	Tarpon	B S	OC
ALBULIDAE - BONEFISHES	<u>Albula vulpes</u>	Bonefish	G S	OC
MORINGUIDAE - SPAGHETTI EELS	<u>Moringua edwardsi</u>	Spaghetti eel	B S	OC
MURAENIDAE - MORAY	<u>Echidnia catenata</u>	Chain moray	K V	C
	<u>Enchelycore nigricans</u>	Viper moray	R S	OC
	<u>Gymnothorax funebris</u>	Green moray	R S	C
	<u>Gymnothorax moringa</u>	Spotted moray	R S	C
	<u>Gymnothorax vicinus</u>	Purplemouth moray	G S	C
	<u>Muraena miliaris</u>	Goldentail moray	R S	OC
CONGRIDAE - CONGER EELS	<u>Nystactichthys halis</u>	Garden eel	B S	OC
OPHICHTHIDEA - SNAKE EELS	<u>Ahlia egmontis</u>	Key worm eel	B D	C
	<u>Aprognathodon platyventris</u>	Stripe eel	R S	OC
	<u>Myrichthys acuminatus</u>	Sharptail eel	R S	C
	<u>Myrichthys oculatus</u>	Goldspotted eel	G S	C
	<u>Myrophis platyrhynchus</u>	Broadnose worm eel	R S	OC
	<u>Ophichthus ophis</u>	Spotted snake eel	B S	OC
CLUPEIDAE - HERRINGS	<u>Harengula clupeiola</u>	False pilchard	B S	VC
	<u>Harengula humeralis</u>	Redear sardine	B S	VC
	<u>Jenkinsia lamprotaenia</u>	Dwarf herring	B S	VC
ENGRAULIDAE - ANCHOVIES	<u>Anchoa choerostoma</u>	Fry	B S	OC
	<u>Anchoa lyolepis</u>	Dusky anchovy	B W	C
SYNODONTIDAE - LIZARDFISHES	<u>Synodus intermedius</u>	Sand diver	B W	VC
	<u>Synodus saurus</u>	Lizardfish	B S	C
	<u>Synodus synodus</u>	Red lizardfish	B S	C
GOBIESOCIDAE - CLINGFISHES	<u>Arcos macrophthalmus</u>	Padded clingfish	K V	C
	<u>Arcos rubiginosus</u>	Red clingfish	K V	C

OGCOCEPHALIDAE - BATFISHES				
	<u>Ogcocephalus nasutus</u>	Shortnose batfish	B S	OC
OPHIDIIDAE - CUSK-EELS AND BROTLAS				
	<u>Ogilbia</u> sp.	Brotula	R S	OC
	<u>Stygnobrotula</u>			
	<u>latebricola</u>	Black brotula	R S	OC
EXOCOETIDEA-FLYINGFISHES AND HALFBEAKS				
	<u>Cypselurus heterurus</u>	Atlantic flyingfish	O V	C
	<u>Hemiramphus</u>			
	<u>brasiliensis</u>	Ballyhoo	O V	C
BELONIDEA - NEEDLEFISHES				
	<u>Ablennes hians</u>	Flat needlefish	O V	OC
	<u>Strongylura timucu</u>	Timucu	M V	C
	<u>Tylosurus crocodilus</u>	Houndfish	B V	C
ATHERINIDAE - SILVERSIDES				
	<u>Hypoatherina harringtonensis</u>	Reef silverside	R V	C
	<u>Atherinomorus stripes</u>	Hardhead silverside	B V	VC
HOLOCENTRIDAE - SQUIRRELFISHES				
	<u>Holocentrus coruscus</u>	Reef squirrelfish	R S	C
	<u>Holocentrus poco</u>	Saddle squirrelfish	R S	C
	<u>Holocentrus vexillarius</u>	Dusky squirrelfish	R S	C
	<u>Holocentrus marianus</u>	Longjaw squirrelfish	R S	C
	<u>Holocentrus asencsionis</u>	Squirrelfish	R S	C
	<u>Holocentrus rufus</u>	Longspine squirrelfish	R W	VC
	<u>Myripristis jacobus</u>	Blackbar soldierfish	R S	C
	<u>Plectrypops retrospinis</u>	Cardinal soldierfish	R W	OC
AULOSTOMIDAE - TRUMPETFISHES				
	<u>Aulostomus maculatus</u>	Trumpetfish	R W	C
FISTULARIIDAE - CORNETFISHES				
	<u>Fistularia tabacaria</u>	Bluespotted cornetfish	G S	OC
SYNGNATHIDAE - PIPEFISHES AND SEAHORSES				
	<u>Cosmocampus</u>			
	<u>brachycephalus</u>	Crested pipefish	G S	OC
	<u>Hippocampus reidi</u>	Longsnout seahorse	R S	OC
	<u>Micrognathus ensenadae</u>	Harlequin pipefish	R S	OC
	<u>Syngnathus caribbaeus</u>	Caribbean pipefish	B S	OC
	<u>Syngnathus dunckeri</u>	Pugnose pipefish	G S	OC
GENTROPOMIDAE - SNOOKS				
	<u>Centropomus undecimalis</u>	Snook	B S	OC
SERRANIDAE - SEA BASSES				
	<u>Epinephalus afer</u>	Mutton hamlet	G S	OC
	<u>Epinephalus fulvus</u>	Coney	R W	C
	<u>Epinephelus adscensionis</u>	Rock hind	R S	C
	<u>Epinephelus guttatus</u>	Red hind	R W	C
	<u>Epinephelus itajara</u>	Jewfish	R W	OC
	<u>Epinephelus morio</u>	Red grouper	B D	OC
	<u>Epinephalus mystacinus</u>	Misty grouper	B D	OC
	<u>Epinephalus striatus</u>	Nassua grouper	R S	C

	<u>Gonioplectrus hispanus</u>	Spanish flag	--	RA
	<u>Hypoplectrus aberrans</u>	Yellowbelly hamlet	R S	C
	<u>Hypoplectrus chlorurus</u>	Yellowtail hamlet	R S	C
	<u>Hypoplectrus guttavarius</u>	Shy hamlet	R S	OC
	<u>Hypoplectrus nigricans</u>	Black hamlet	R S	C
	<u>Hypoplectrus unicolor</u>	Barred hamlet	R S	VC
	<u>Hypoplectrus puella</u>	Butter hamlet	R S	C
	<u>Chorististium carmabi</u>	Candy basslet	R D	OC
	<u>Liopropoma mowbrayi</u>	Cave bass	R D	OC
	<u>Liopropoma rubre</u>	Peppermint bass	R W	C
	<u>Mycteroperca</u>			
	<u>interstitialis</u>	Yellowmouth grouper	R W	OC
	<u>Mycteroperca tigris</u>	Tiger grouper	R W	C
	<u>Mycteroperca venenosa</u>	Yellowfin grouper	R W	OC
	<u>Paranthias furcifer</u>	Creole-fish	R D	OC
	<u>Petrometopon cruentatum</u>	Graysby	R W	C
	<u>Schultzea beta</u>	School bass	R D	C
	<u>Serranus baldwini</u>	Lantern bass	B W	OC
	<u>Serranus tabacarius</u>	Tobaccofish	B W	C
	<u>Serranus tigrinus</u>	Harlequin bass	R W	OC
	<u>Serranus torquarum</u>	Chalk bass	B D	OC
GRAMMIDAE - FAIRY BASSLETS				
	<u>Gramma linki</u>		R D	OC
	<u>Gramma loreto</u>	Fairy basslet	R W	C
GRAMMISTIDAE - SOAPFISHES				
	<u>Pseudogramma gregoryi</u>	Reef bass	R S	OC
	<u>Rypticus bistrispinus</u>	Freckled soapfish	B S	OC
	<u>Rypticus saponaceus</u>	Greater soapfish	R S	C
PRIACANTHIDAE - BIGEYES				
	<u>Priacanthus arenatus</u>	Bigeye	R S	C
	<u>Priacanthus cruentatus</u>	Glasseye snapper	R S	OC
	<u>Pristigenys alta</u>	Short bigeye	R D	RA
APOGONIDAE - CARDINALFISHES				
	<u>Apogon binotatus</u>	Barred cardinalfish	R W	VC
	<u>Apogonlachneri</u>	Whitestar cardinalfish	R W	C
	<u>Apogon maculatus</u>	Flamefish	R W	VC
	<u>Apogon planifrons</u>	Pale cardinalfish	R W	OC
	<u>Apogon quadrisquamatus</u>	Sawcheek cardinalfish	R W	C
	<u>Apogon townsendi</u>	Belted cardinalfish	R W	C
	<u>Astrapogon puncticulatus</u>	Blackfin cardinalfish	R S	OC
	<u>Astrapogon stellatus</u>	Conchfish	S	OC
	<u>Apogon affinis</u>	Bigtooth cardinalfish	R W	OC
	<u>Phaeoptyx conklini</u>	Freckled cardinalfish	R S	VC
	<u>Phaeoptyx pigmentaria</u>	Dusky cardinalfish	R W	OC
	<u>Phaeoptyx xenus</u>	Sponge cardinalfish	R W	OC
MALACANTHIDAE - SAND TILEFISHES				
	<u>Malacanthus plumeieri</u>	Sand tilefish	B S	C
ECHENEIDAE - REMORAS				
	<u>Echeneis naucrates</u>	Sharksucker	R W	C
	<u>Remora remora</u>	Remora	R W	OC

CARANGIDAE - JACKS AND POMPANOS			
<u>Alectis ciliaris</u>	African pompano	O W	OC
<u>Caranx bartholomaei</u>	Yellow jack	R W	C
<u>Caranx crysos</u>	Blue runner	O W	C
<u>Caranx hippos</u>	Creville jack	O W	OC
<u>Caranx latus</u>	Horse-eye jack	R W	C
<u>Caranx lugubris</u>	Black jack	O D	OC
<u>Caranx ruber</u>	Bar jack	R S	VC
<u>Decapterus macarellus</u>	Mackerel scad	O W	OC
<u>Elagatis bipinnulata</u>	Rainbow runner	O W	OC
<u>Selar crumenophthalmus</u>	Bigeye scad	R S	C
<u>Selene vomer</u>	Lookdown	B S	OC
<u>Seriola dumerili</u>	Greater amberjack	R W	OC
<u>Seriola rivoliana</u>	Almaco jack	R W	OC
<u>Trachinotus falcatus</u>	Permit	R W	OC
<u>Trachinotus goodei</u>	Palometa	B V	C
CORYPHAENIDAE - DOLPHIN			
<u>Coryphaena equisetis</u>	Pompano dolphin	O W	OC
<u>Coryphaena hippurus</u>	Dolphin	O W	OC
EMMELICHTHYIDAE - BONNETMOUTHS			
<u>Inermia vittata</u>	Boga	R D	C
LUTJANIDAE - SNAPPERS			
<u>Apsilus dentatus</u>	Black snapper	D	OC
<u>Etelis oculatus</u>	Queen snapper	D	OC
<u>Lutjanus analis</u>	Mutton snapper	G W	C
<u>Lutjanus apodus</u>	Schoolmaster	R S	VC
<u>Lutjanus buccanella</u>	Blackfin snapper	B D	OC
<u>Lutjanus cyanopterus</u>	Cubero snapper	R W	OC
<u>Lutjanus griseus</u>	Gray snapper	R W	OC
<u>Lutjanus jocu</u>	Dog snapper	R W	C
<u>Lutjanus mahogani</u>	Mahogany snapper	R W	C
<u>Lutjanus synagris</u>	Lane snapper	R W	C
<u>Lutjanus vivanus</u>	Silk snapper	D	C
<u>Ocyurus chrysurus</u>	Yellowtail snapper	R S	C
<u>Pristipomoides macrophthalmus</u>	Voraz	D	C
<u>Rhomboplites aurorubens</u>	Vermilion snapper	D	OC
GERREIDAE - MOJARRAS			
<u>Eucinostomus argenteus</u>	Spotfin mojarra	B S	C
<u>Eucinostomus gula</u>	Silver jenny	B S	C
<u>Eucinostomus lefroyi</u>	Mottled mojarra	B S	OC
<u>Gerres cinereus</u>	Yellowfin mojarra	B S	VC
POMADASYIDAE - GRUNTS			
<u>Anisotremus surinamensis</u>	Black margate	R S	OC
<u>Anisotremus virginicus</u>	Porkfish	R S	OC
<u>Haemulon album</u>	Margate	B C	C
<u>Haemulon aurolineatum</u>	Tomatate	R W	C
<u>Haemulon carbonarium</u>	Ceasar grunt	R W	OC
<u>Haemulon chrysargyreum</u>	Smallmouth grunt	R W	C
<u>Haemulon flavolineatum</u>	French grunt	R W	VC
<u>Haemulon macrostomum</u>	Spanish grunt	R W	OC
<u>Haemulon melanurum</u>	Cottonwick	R W	OC
<u>Haemulon parrai</u>	Sailors choice	R W	C

	<u>Haemulon plumieri</u>	White grunt	R W	C
	<u>Haemulon sciurus</u>	Bluestriped grunt	R W	C
SPARIDAE - PORGIES				
	<u>Archosargus rhomboidalis</u>	Sea bream	M S	OC
	<u>Calamus bajonado</u>	Jolthead porgy	R W	OC
	<u>Calamus penna</u>	Sheepshead porgy	R W	OC
	<u>Calamus pennatula</u>	Pluma	R W	OC
SCIAENIDAE - DRUMS				
	<u>Bairdiella sanctaeluciae</u>	Striped croaker	B S	OC
	<u>Equetus lanceolatus</u>	Jackknife-fish	R S	C
	<u>Equetus punctatus</u>	Spotted drum	R S	OC
	<u>Odontoscion dentex</u>	Reef croaker	R S	C
	<u>Equetus acuminatus</u>	High-hat	R S	C
MULLIDAE - GOATFISHES				
	<u>Mulloidichthys martinicus</u>	Yellow goatfish	B S	C
	<u>Pseudupeneus maculatus</u>	Spotted goatfish	B S	C
PEMPHERIDAE - SWEEPERS				
	<u>Pempheris schomoburgki</u>	Glassy sweeper	R S	C
KYPHOSIDAE - SEA CHUBS				
	<u>Kyphosus sectatrix</u>	Bermuda chub	R S	C
EPHIPPIDAE - SPADEFISHES				
	<u>Chaetodipterus faber</u>	Atlantic spadefish	R W	OC
POMACANTHIDAE - ANGELFISHES				
	<u>Holacanthus ciliaris</u>	Queen angelfish	R S	C
	<u>Holacanthus tricolor</u>	Rock beauty	R S	C
	<u>Pomacanthus arcuatus</u>	Gray angelfish	R S	C
	<u>Pomacanthus paru</u>	French angelfish	R S	C
CHAETODONTIDAE - BUTTERFLYFISHES				
	<u>Centropyge argi</u>	Cherubfish	R D	OC
	<u>Chaetodon capistratus</u>	Foureye butterfly	R S	VC
	<u>Chaetodon ocellatus</u>	Spotfin butterfly	R W	OC
	<u>Chaetodon sedentarius</u>	Reef butterflyfish	R W	OC
	<u>Chaetodon striatus</u>	Banded butterflyfish	R W	C
	<u>Prognathodes aculeatus</u>	Longsnout butterflyfish	R D	OC
CICHLIDAE - CICHLIDS				
	<u>Cichla ocellaris</u>	Peacock bass	F	OC
	<u>Tilapia mossambica</u>	Tilapia	F	OC
POMACENTRIDAE - DAMSELFISHES				
	<u>Abudefduf saxatilis</u>	Sergeant major	R S	C
	<u>Abudefduf taurus</u>	Night sergeant	K V	C
	<u>Chromis cyaneus</u>	Blue chromis	R W	C
	<u>Chromis insolatus</u>	Sunshinefish	R D	C
	<u>Chromis multilineatus</u>	Brown chromis	R W	C
	<u>Chromis scotti</u>	Purple reeffish	R D	OC
	<u>Pomacentrus fuscus</u>	Dusky damselfish	R S	VC
	<u>Eupomacentrus leucostictus</u>	Beaugregory	R S	VC
	<u>Eupomacentrus mellis</u>	Honey gregory	R S	OC
	<u>Pomacentrus partitus</u>	Bicolor damselfish	R W	C
	<u>Pomacentrus planifrons</u>	Threespot damselfish	R S	C
	<u>Eupomacentrus variabilis</u>	Cocoa damselfish	R S	OC
	<u>Microspathodon chrysurus</u>	Yellowtail damselfish	R S	C

CIRRHITHIDAE - HAWKFISHES			
	<u>Amblycirrhitus pinos</u>	Redspotted hawkfish	R W OC
LABRIDAE - WRASSES			
	<u>Bodianus pulchellus</u>	Spotfin hogfish	R D OC
	<u>Bodianus rufus</u>	Spanish hogfish	R W C
	<u>Clepticus parrai</u>	Creole wrasse	R W C
	<u>Doratonotus megalepis</u>	Dwarf wrasse	G S OC
	<u>Halichoeres bivittatus</u>	Slippery dick	R S C
	<u>Halichoeres garnoti</u>	Yellowhead wrasse	R W OC
	<u>Halichoeres maculipinna</u>	Clown wrasse	R S C
	<u>Halichoeres pictus</u>	Rainbow wrasse	R W OC
	<u>Halichoeres Poeyi</u>	Blackear wrasse	G S VC
	<u>Halichoeres radiatus</u>	Puddingwife	R S C
	<u>Hemipteronotus martinicensis</u>	Straight-tail razorfish	B W C
	<u>Lachnolaimus maximus</u>	Hogfish	R S RA
	<u>Thalassoma bifasciatum</u>	Bluehead wrasse	R S VC
SCARIDAE - PARROTFISHES			
	<u>Cryptotomus roseus</u>	Bluelip parrotfish	G W C
	<u>Nicholsina usta</u>	Emerald parrotfish	G S OC
	<u>Scarus coelestinus</u>	Midnight parrotfish	R S OC
	<u>Scarus coeruleus</u>	Blue parrotfish	R W OC
	<u>Scarus croicensis</u>	Striped parrotfish	R S C
	<u>Scarus taeniopterus</u>	Princess parrotfish	R W C
	<u>Scarus vetula</u>	Queen parrotfish	R S VC
	<u>Sparisoma atomarium</u>	Greenblotch parrotfish	R W OC
	<u>Sparisoma aurofrenatum</u>	Redband parrotfish	R S C
	<u>Sparisoma radians</u>	Bucktooth parrotfish	G S C
	<u>Sparisoma rubripinne</u>	Yellowtail parrotfish	R S C
	<u>Sparisoma viride</u>	Spotlight parrotfish	R S VC
MUGILIDAE - MULLET			
	<u>Mugil curema</u>	White mullet	M S C
	<u>Mugil liza</u>	Liza	M S OC
SPHYRAENIDAE - BARRACUDAS			
	<u>Sphyaena barracuda</u>	Great barracuda	R W C
	<u>Sphyaena picudilla</u>	Southern sennet	R W OC
POLYNEMIDAE - THREADFINS			
	<u>Polydactylus oligodon</u>	Little scale threadfin	G S OC
	<u>Polydactylus virginicus</u>	Barbu	B S OC
OPISTOGNATHIDAE - JAWFISHES			
	<u>Opistognathus aurifrons</u>	Yellowhead jawfish	B W C
	<u>Opistognathus gilberti</u>	Yellow jawfish	B D OC
	<u>Opistognathus maxilloso</u>	Mottled jawfish	B S C
CLINIDAE - CLINLIDS			
	<u>Acanthemblemaria spinosa</u>	Spinyhead blenny	R S C
	<u>Cheanopsis limbaughi</u>	Yellowface pikeblenny	B S OC
	<u>Emblemariopsis bahamensis</u>	Blackhead blenny	R S OC
	<u>Enneanectes boehikei</u>	Roughhead triplefin	R S OC
	<u>Labrisomus bucciferus</u>	Puffcheek blenny	W S C
	<u>Labrisomus guppyi</u>	Mimic blenny	K S C
	<u>Labrisomus nuchipinnis</u>	Hairy blenny	B S VC

	<u>Lucayablennius zingaro</u>	Arrow blenny	R W	C
	<u>Malacoctenus aurolineatus</u>	Goldline blenny	K S	OC
	<u>Malacoctenus erdmani</u>	Imitator blenny	K S	OC
	<u>Malacoctenus gilli</u>	Dusky blenny	B S	C
	<u>Malacoctenus macropus</u>	Rosy blenny	G S	OC
	<u>Makacoctenus triangulatus</u>	Saddled blenny	R S	C
	<u>Paraclinus fasciatus</u>	Banded blenny	R V	OC
	<u>Starksia atlantica</u>	Smootheye blenny	R S	OC
	<u>Starksia fasciata</u>	Blackbar blenny	R S	OC
	<u>Starksia nanodes</u>	Dwarf blenny	R W	OC
	<u>Stathmonotus gymnodermis</u>	Naked blenny	R S	OC
	<u>Stathmonotus hemphilli</u>	Blackbelly blenny	K S	OC
	<u>Stathmonotus stahli</u>	Eelgrass blenny	R S	OC
BLENNIIDAE -	COMBTOOTH BLENNIES			
	<u>Entomacrodus nigricans</u>	Pearl blenny	K S	C
	<u>Hypleurochilus springeri</u>	Orangespotted blenny	R S	C
	<u>Hypsoblennius exstochilus</u>	Longhorn blenny	K S	OC
	<u>Ophioblennius atlanticus</u>	Redlip blenny		
CALLIONYMIDAE -	DRAGNETS			
	<u>Callionymus bairdi</u>	Coral dragonet	G S	C
ELEOTRIDAE -	SLEEPERS			
	<u>Dormitator maculatus</u>	Fat sleeper	M S	OC
	<u>Erotelis smaragdus</u>	Emerald sleeper	M S	OC
GOBIIDAE -	GOBIES			
	<u>Bathygobius curacao</u>	Notchtongue goby	M S	OC
	<u>Bathygobius mystacium</u>	Island frillfin	B S	OC
	<u>Bathygobius soporator</u>	Frillfin goby	M S	OC
	<u>Coryphopterus alloides</u>	Barfin goby	R W	OC
	<u>Coryphopterus glaucofraenum</u>	Bridled goby	B W	C
	<u>Coryphopterus hyalinus</u>	Glass goby	R W	OC
	<u>Coryphopterus lipernes</u>	Peppermint goby	R W	OC
	<u>Coryphopterus personatus</u>	Masked goby	R W	OC
	<u>Evorthodus lyricus</u>	Lyre goby	M S	OC
	<u>Ginsburgellus novemlineatus</u>	Nineline goby	B W	C
	<u>Gnatholepis thompsoni</u>	Goldspot goby	B W	VC
	<u>Gobionellus spp.</u>		M S	OC
	<u>Gobionellus oceanicus</u>	Highfin goby	B S	OC
	<u>Gobiosoma chancei</u>	Shortstripe goby	R W	C
	<u>Gobiosoma dilepis</u>	Orangeside goby	R S	OC
	<u>Gobiosoma evelyneae</u>	Sharknose goby	R S	C
	<u>Gobiosoma multifasciatum</u>	Greenband goby	K V	OC
	<u>Gobiosoma genie</u>	Cleaning goby	R S	C
	<u>Gobiosoma saucrum</u>	Figure-eight goby	R S	OC
	<u>Gobiosoma tenox</u>	Slaty goby	R W	OC
	<u>Ioglossus helenae</u>	Hovering goby	B D	OC
	<u>Nes longus</u>	Orangespotted goby	B S	C
	<u>Quisquilius hipoliti</u>	Rusty goby	R W	C
	<u>Risor ruber</u>	Smallmouth goby	R S	OC
	<u>Sicydium plumieri</u>	Sirajo goby	F	OC

ACANTHURIDAE - SURGEONFISHES				
	<u>Acanthruus bahianus</u>	Ocean surgeon	R S	C
	<u>Acanthurus chirurgus</u>	Doctorfish	R W	C
	<u>Acanthurus coeruleus</u>	Blue tang	R S	VC
SCOMBRIDAE - MACKERELS AND TUNA				
	<u>Acanthocybium solanderi</u>	Wahoo	O W	C
	<u>Euthynnus alletteratus</u>	Little tunny	O W	C
	<u>Euthynnus pelamis</u>	Skipjack tuna	O W	OC
	<u>Scomberomorus regalis</u>	Cero	R W	C
	<u>Thunnus alalunga</u>	Albacore	O W	OC
	<u>Thunnus albacore</u>	Yellowfin tuna	O W	OC
	<u>Thunnus atlanticus</u>	Blackfin tuna	O W	OC
STROMATEIDAE - BUTTERFISHES				
	<u>Nomeus gronovii</u>	Man-of-war fish	O V	OC
SCORPAENIDAE - SCORPIONFISHES				
	<u>Scorpaena grandicornis</u>	Plumed scorpionfish	G S	OC
	<u>Scorpaena inermis</u>	Mushroom scorpionfish	S W	OC
	<u>Scorpaena plumieri</u>	Spotted scorpionfish	R S	C
	<u>Scorpaena caribbaeus</u>	Reef scorpionfish	R S	C
DACTYLOPTERIDAE - FLYING GURNARDS				
	<u>Dactylopterus volitans</u>	Flying gurnard	B S	OC
BOTHIDAE - LEFTEYE FLOUNDERS				
	<u>Bothus lunatus</u>	Peacock flounder	B S	C
	<u>Bothus maculiferus</u>	Maculated flounder	R S	OC
	<u>Bothus ocellatus</u>	Eyed flounder	B S	C
SOLEIDAE - SOLES				
	<u>Trinectes inscriptus</u>	Scrawled sole	M S	OC
BALISTIDAE - TRIGGERFISHES AND FILEFISHES				
	<u>Aluterus scriptus</u>	Scrawled filefish	R S	OC
	<u>Balistes capriscus</u>	Gray triggerfish	R W	OC
	<u>Balistes vetula</u>	Queen triggerfish	R W	C
	<u>Cantherhines macrocerus</u>	Whitespotted filefish	R S	OC
	<u>Cantherhines pullus</u>	Orangespotted filefish	R S	C
	<u>Canthidermis sufflamen</u>	Ocean triggerfish	R W	OC
	<u>Melichthys niger</u>	Black durgon	R W	C
	<u>Monacanthus ciliatus</u>	Fringed filefish	G S	C
	<u>Monacanthus tuckeri</u>	Slender filefish	R S	C
	<u>Xanthichthys ringens</u>	Sargassum triggerfish	R D	C
OSTRACIIDAE - BOXFISHES				
	<u>Lactophrys bicaudalis</u>	Spotted trunkfish	R S	OC
	<u>Lactophrys polygonia</u>	Honeycomb cowfish	R W	OC
	<u>Lactophrys quadricornis</u>	Scrawled cowfish	G S	C
	<u>Lactophrys trigonus</u>	Trunkfish	G S	OC
	<u>Lactophrys triqueter</u>	Smooth trunkfish	R S	C
TETRAODONTIDAE - PUFFERS				
	<u>Canthigaster rostrata</u>	Sharpnose puffer	R W	VC
	<u>Sphoeroides spengleri</u>	Bandtail puffer	G S	C
	<u>Sphoeroides testudineus</u>	Checkered puffer	M S	C
DIODONTIDAE - PORCUPINEFISHES				
	<u>Diodon hystrix</u>	Porcupinefish	R S	C
	<u>Diodon holocanthus</u>	Balloonfish	G S	VC

KEY TO HABITATS

First letter represents type of habitat:

B = SAND, RUBBLE
G = GRASSBED
K = ROCKY SHORE, LIMESTONE SUBSTRATE
M = MANGROVE
O = OCEANIC, OCCURRING AWAY FROM
SHORELINE
R = REEF

Second letter represents depth:

W = WIDE DEPTH RANGE
V = VERY SHALLOW, TOP 2 METERS
S = SHALLOW, 1 TO 15 METERS
D = DEEP, BELOW 15 METERS AND OFTEN
OUT OF RANGE OF THE SURVEY

KEY TO ABUNDANCE

C = COMMON
OC = OCCASIONAL
VC = VERY COMMON
R = RARE

This list includes all fish seen during 10/84 Hydrolab mission and subsequent dives over the last 4 years to the site. The abundance rating is taken from I. Clavijo, J. Yntema and J. Ogden, An Annotated List of the Fishes of St. Croix, U.S. Virgin Islands, 1980 and John E. Randall, Caribbean Reef Fishes, 1983.

APPENDIX I

PLANTS OF ESTATE SUGAR BAY

FAMILY	SCIENTIFIC NAME	COMMON NAME
AMERANTHACEAE	<u>Blutaparon vermiculare</u> (L.) Mears <u>Achyranthes indica</u> Mill.	Salt weed man-better-man
ANACARDIACEAE	<u>Mangifera indica</u> L.	mango
ANNONACEAE	<u>Annona muricata</u> L. <u>Annona squamosa</u> L. <u>Comocladia dodonaea</u> (L.) Urb.	soursop sugar apple Christmas bush
ASCLEPIADACEAE	<u>Cryptostegia grandiflora</u> R. Br. <u>Calotropis procera</u> (Ait.) R. Br.	Indian rubber giant milkweed
BIGONIACEAE	<u>Tabebuia heterophylla</u> (DC.) Britton <u>Tecoma stans</u> (L.) HBK	white cedar ginger thomas
BORAGINACEAE	<u>Bourreria succulenta</u> Jacq. <u>Cordia alba</u> (Jacq.) Roem & Schult. <u>Cordia alliodora</u> L.	pigeon-berry white manjack red manjack
BURSERACEAE	<u>Bursera simaruba</u> (L.) Sarg.	turpentine tre
CAPPARIDACEAE	<u>Capparis flexuosa</u> (L.) L. <u>Capparis frondosa</u> Jacq. <u>Cleome viscosa</u> L. <u>Morisonia americana</u> L. <u>Capparis indica</u> (L.) Fawc. & Rendle	limber caper rat-bean rat-apple Jamaican caper
CARICACEAE	<u>Carica papaya</u> L.	payaya
CAESALPINACEAE	<u>Caesalpinia bonduc</u> (L.) Roxb. <u>Cassia siamea</u> Lam.	grey nickers yellow cassia
CALASTRACEAE	<u>Schaefferia frutescens</u> Jacq.	Florida boxwoo
COMBRETACEAE	<u>Bucida buceras</u> L. <u>Conocarpus erectus</u> L. <u>Laguncularia racemosa</u> Gaertnf. <u>Terminalia catappa</u> L.	gregre buttonwood white mangrove W.I. almond
COMMELINACEAE	<u>Commelina diffusa</u> Burm. F. <u>Commelina elegans</u> HBK	blue day-flowe
COMPOSITAE	<u>Ageratum conyzoides</u> L. <u>Bidens pilosa</u> L. var alba (L.) O.E.Schultz <u>Pluchea symphitifolia</u> (Miller) Gillis	shepherd's nee sweet scent
CRASSULACEAE	<u>Kalanchoe Pinnata</u> (Lam.) Kurz	leaf of life
CUCURBITACEAE	<u>Momordica charantia</u> L.	maiden apple

CUSUTACEAE	<u>Cuscuta americana</u> L.	dodder
ERYTHROXYLACEAE	<u>Erythroxylum rotundifolium</u> Lulan	indigo
EUPHORBIACEAE	<u>Chamaesyce hirta</u> (L.) Millsp. <u>Codiaeum variegatus</u> (L.) Blume <u>Croton astroites</u> <u>Hippomane mancinella</u> L. <u>Jatropha gossypifolia</u> L. <u>Ricinus communis</u> L. <u>Securinega acidoton</u> (L.) Fawc. & Rendle <u>Tragia volubilis</u> L.	hairy spurge croton maran manchineel wild physic nut castor bean hairy spurge 7-min-itch
FABACEAE:		
CAESALPINIOIDEAE	<u>Haematoxylum campechianum</u> L. <u>Tamarindus indica</u> L.	logwood tamarind
FABOIDEAE	<u>Andira inermis</u> (W. Wright) HBK <u>Crotolaria incana</u> L. <u>Desmodium triflorum</u> (L.) DC. <u>Desmodium incanum</u> DC. <u>Gliricidia sepium</u> (Jacq.) Kunth ex Walp.	dog-almond velvety rattlebox beggar's tick mother-of-cocoa
IMBOSOIDAE	<u>Acacia macracantha</u> Humb. & Bonpl. <u>Acacia tortuosa</u> (L.) Willd. <u>Adenanthera pavonina</u> L. <u>Albizia lebbek</u> (L.) Benth. <u>Leucaena leucacephala</u> (Lam.) Dewite <u>Pithecellobium saman</u> (Willd.) Benth	stink casha casha jumble-bead Tibet tree tan-tan saman
FLACOURTIACEAE	<u>Casearia guianensis</u> (Aubl.) Urban	wild coffee
LABIATAE	<u>Leonotis nepetifolia</u> (L.) Ait. f. in Ait.	hollow stalk
LAURACEAE	<u>Ocotea coriacea</u> (Sw.) Britton	Jamaican
nectandr.	<u>Ocotea floribunda</u> (Sw.) Mez <u>Ocotea membranacea</u> (Sw.) Howard	laurel laurel
LILIACEAE	<u>Sansevieria</u> sp.	snake plant
MALPIGHIACEAE	<u>Bunchosia glandulosa</u> (Cav.) L.C. Rich. <u>Malpighia infestissima</u> (A. Juss.) Rich. <u>Stigmaphyllon periplocifolium</u>	cafe forastero stingbush
MALVACEAE	<u>Gossypium hirsutum</u> <u>Malvastrum coromandelianum</u> (L.) Garcke <u>Malvastrum corchorifolium</u> (Desv.) Britt. <u>Sida acuta</u> Berm F.	cotton soap bush wire weed
MELIACEAE	<u>Swietenia mahogoni</u> (L.) Jacq. <u>Trichilia hirta</u> L.	W. I. mahogany broomstick

MORACEAE	<u>Ficus citrifolia</u> P. Miller	shortleaf fig
MYRTACEAE	<u>Eugenia rhombea</u> (Berg) Krug & Urban	spiceberry
eugenia		
NYCTAGINACEAE	<u>Pisonia aculeata</u> L.	prickly mampoo
	<u>Guapira fragrans</u> (Dum.-Cours) Little	black mampoo
ONAGRACEAE	<u>Ludwigia</u> sp.	
PALMACEAE	<u>Cocos nucifera</u> L.	coconut palm
PHYTOLACACEAE	<u>Rivina humilis</u> L.	cat's blood
	<u>Petiveria alliacea</u> L.	garlic weed
POACEA	<u>Bambusa vulgaris</u> Schrod. ex Wendl.	bamboo
	<u>Panicum maximum</u> Jacq.	guinea grass
POLYGONACEAE	<u>Antigonon leptopus</u> Hook. & Arn.	Mexican love
chain		
RHIZOPHORACEAE	<u>Rhizophora mangle</u> L.	red mangrove
RUBIACEAE	<u>Psychotria nervosa</u> Sw.	
	<u>Randia aculeata</u> L.	box-briar
RUTACEAE	<u>Triphasia trifolia</u> (Brum. f.) P. Wilson	sweet lime
	<u>Zanthoxylum martinicense</u> (Lam.) DC.	white prickle
	<u>Zanthoxylum monophyllum</u> (Lam.) P. Wilson	yellow prickle
SAPINDACEAE	<u>Melicoccus bijugatus</u>	genip
SAPOTACEAE	<u>Chrysophyllum pauciflorum</u> Lam.	caimito de perr
TYPHACEAE	<u>Typha domingensis</u> Pers.	cattail
VERBENACEAE	<u>Citharexylum fruticosum</u> L.	pendula
	<u>Lantana camara</u>	yellow sage
	<u>Lantana invulcrata</u> L.	wild sage
VITACEAE	<u>Cissus sicyoides</u> L.	pinekoop
ZYGOPHYLLACEAE	<u>Guaicacum officinale</u> L.	lignumvitae
	<u>Acrostichum daneaifolium</u>	swamp fern

APPENDIX J

THREATENED AND ENDANGERED SPECIES

POSSIBLY OCCURRING IN THE AREA

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS
M A M M A L S			
PHYSETERIDAE	<u>Physeter catodon</u>	Sperm whale	E
BALAENOPTERIDAE	<u>Balaenoptera physalus</u>	Finback whale	E
	<u>Megaptera novaeangliae</u>	Humpback whale	E
	<u>Balaenoptera borealis</u>	Sei whale	E
B I R D S			
PELECANIDAE	<u>Pelecanus occidentalis</u>	Brown pelican	E
LARIDAE	<u>Sterna dougallii dougallii</u>	Roseate tern	E
R E P T I L E S			
GEKKONIDAE	<u>Sphaerodactylus beattyi</u>	St. Croix ground lizard	E
CHELONIIDAE	<u>Chelonia mydas</u>	Green sea turtle	T
	<u>Eretmochelys imbricata</u>	Hawksbill sea turtle	E
	<u>Dermochelys coriacea</u>	Leatherback sea turtle	E
	<u>Caretta caretta</u>	Loggerhead sea turtle	T
BOIDAE	<u>Epicrates monensis granti</u>	V. I. tree boa	E
P L A N T S			
RUTACEAE	<u>Zanthoxylum thomsonianum</u>	St. Thomas prickly-ash	E

E = Endangered

T = Threatened

MEMORANDUM OF AGREEMENT
between
the National Park Service
and
The Territorial Government of the U. S. Virgin Islands

ARTICLE I

A. Background

The United States National Park Service has the dual function of protecting natural and cultural resources and for providing an educational and recreational opportunity to an increasing number of visitors. National Park System areas in the Virgin Islands are receiving increased threats to the natural and cultural resources as a direct effect of visitor use. A variety of other pressures such as the overuse of the area fisheries, encroachment of exotic plants and animals, an increase in water pollution and increased development on adjacent lands threaten the resources.

The Government of the U. S. Virgin Islands has a similar obligation to its citizens and visitors in protecting and maintaining the area's significant natural and cultural resources and providing for the well-being of its residents and visitors.

B. Authority and Mutual Intent

WHEREAS, the Act of August 25, 1916, 39 Stat. 535, and amendments thereto, 16 USC, Section 1, declares that the National Park Service (hereinafter known as NPS) shall promote and regulate the use of Federal areas known as national parks, monuments and reservations by such means and measures as conform to the fundamental purpose of the parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same for future generations; and

WHEREAS, 16 USC Section 171. authorizes the Secretary of the Interior to aid the several states and political subdivisions thereof for the purposes of developing coordinated and adequate public park and recreational area facilities for the people of the United States; and

WHEREAS, the Government of the U. S. Virgin Islands (hereinafter known as the VI Government) has authority as follows: in March 1973, the Virgin Islands Legislature passed Act 3190 that established a Territorial Park Law and established a Territorial park system; and the authorities provided by the Act of December 15, 1986 (No. 16-0651), Section 2, encourages the NPS to "establish, protect, develop and administer facilities for a Christopher Columbus Historic Landing Site;" Sections 4 & 5 include NPS assistance in developing a comprehensive plan for the establishment of and

management of the Columbus Historic Landing Site; and Section 6 requires the VI Government to enter into a cooperative agreement with NPS for the management of the Columbus Historic Landing Site and the training of employees of the VI Government.

WHEREAS, this Agreement is designed to provide a vehicle by which the NPS and the VI Government can work together for the long-term protection of Virgin Islands natural and cultural resources; and

WHEREAS, in an effort to more effectively protect resources, serve the Virgin Islands residents and visitors and stimulate a greater cooperation between the two parties, a cooperative program of planning, education, training, extension and resource management will benefit both parties.

NOW THEREFORE, in consideration of the above premises and in the common interest of mutual benefits in attainment of common objectives, the parties hereto desire to cooperate and mutually agree as follows:

1. To establish a long-term cooperative relationship between the NPS and the VI Government for the purpose of mutually and interactively furthering the interests of both. The main but not the sole interest of both parties is developing cooperative planning efforts, developing and implementing sound resource management, education, training and conservation projects; and

2. To consider jointly, at such places and at such intervals as may be agreed upon by both parties hereto, programs and projects relating to the protection and perpetuation of Virgin Islands' natural and cultural resources.

ARTICLE II

A. Scope of Activities

The specific scope of this Agreement includes:

1. Studying the potential development, implementation and operation of a Columbus Landing National Historic Site at Salt River, St. Croix;

2. The development of a comprehensive plan for a Territorial Park System within the U. S. Virgin Islands;

3. Development of a training program for Territorial Park System employees to manage and operate Virgin Islands Territorial Park System units; and

4. The establishment and participation in a Territorial Park System Advisory Board.

E. B. The VI Government will undertake the following in compliance with the objectives of this Agreement:

1. Initiate a cooperative planning effort to examine all pertinent sites for nomination to Territorial Park status;

2. Select 6 to 10 individuals for long-term training in park administration, maintenance, resource management, protection and interpretation;

3. Provide salaries, benefits, travel costs and per diem for the 6 to 10 employees throughout the training program;

4. Initiate the development of a Territorial Park System Advisory Board that will have responsibilities for the new Territorial Park System and that will review the

alternatives for a Columbus Landing National Historic Site and other facets as proposed in this Agreement; and

5. Provide the sum of \$60,000 to the NPS for the purpose of developing comprehensive plans for the establishment and management of a potential Columbus Landing National Historic Site and carrying out other provisions of this Agreement.

C. The NPS will undertake the following in compliance with the objectives of this Agreement:

1. Initiate the development of alternatives for the administration and management of a potential Columbus Landing National Historic Site utilizing the planning process and public involvement in developing long-term solutions to the management of the area;

2. Assist with the planning effort to identify, assess and select appropriate sites within the Virgin Islands for inclusion into a Territorial Park System;

3. Train 6 to 10 Territorial employees in all facets of park management; i.e., administration, maintenance, resource management, protection and interpretation. Individual development plans will be developed for each individual to enhance his/her expected responsibilities. Select training courses for the identified Territorial employees. Training

will commence at a time and on a schedule that will be the subject of a separate Sub-Agreement, as per Article III, A.2., of this Memorandum of Agreement; and

4. Participate in a Territorial Park System Advisory Board in carrying out the responsibilities under this Agreement.

ARTICLE III

A. Terms of Agreement

1. This Agreement may be modified by amendment at any time by mutual agreement of both parties.

2. Tasks shall be issued under this Agreement as Sub-Agreements which shall specify the Statement of Work, deliverables, delivery schedule, budget and justification explaining mutuality of benefits.

3. This Agreement constitutes the full, complete and entire Agreement between the parties hereto. No modification or amendment shall be binding on either party unless such modification or attachment shall be in writing, executed in duplicate by both parties hereto, attached to this Agreement, and incorporated in, and be referenced as part of this Agreement.

4. This Agreement will terminate ten (10) years from its date of execution, and may be renewed thereafter for successive five (5) year terms at the express agreement of the parties given prior to expiration.

ARTICLE IV

A. Key Officials

The personnel specified below by titles are considered to be essential to the activities performed here under.

NATIONAL PARK SERVICE

Chief, Planning & Compliance
Division, Southeast Region

Superintendent, Virgin Islands
National Park

Contracting Officer, Southeast
Region

GOVERNMENT OF THE U. S. VIRGIN ISLANDS

Commissioner for Property and
Procurement, U.S. Virgin
Islands Territorial Government
Commissioner for Planning and
Natural Resources

ARTICLE V

A. Termination

This Agreement may be terminated by either party with 60 days notice to the other.

ARTICLE VI

A. Required Clauses

1. During the performance of this Agreement, the participants agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex or national origin.

2. No member or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

IN WITNESS WHEREOF, the NPS and the VI Government have executed
this Agreement on the 12th day of July, 1988.

7/12/88
Date

By:

Robert M. Baker
Regional Director
Southeast Region
National Park Service
75 Spring Street, SW
Atlanta, Georgia 30303

7/12/88
Date

By:

Alexander A. Farrelly
Governor
United States Virgin Islands
Charlotte Amalie
U. S. Virgin Islands 00801

APPENDIX L

ACT NO. 5229

BILL NO. 16-0651

SIXTEENTH LEGISLATURE OF THE VIRGIN ISLANDS OF THE UNITED STATES

Regular Session

1986

To recognize the Christopher Columbus Jubilee Committee, Inc., as the official Virgin Islands entity; to prepare for and commemorate the 500th anniversary of Christopher Columbus' Voyages of Exploration to the New World, including his arrival at St. Croix in 1493; to appropriate funds for purposes related thereto; and for other purposes related thereto

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WHEREAS Christopher Columbus landed on San Salvador, Cuba and Hispaniola in 1492; and

WHEREAS in 1493 Columbus returned to the New World and anchored at, among other islands, areas now under the flag of the United States, to wit: first St. Croix, and subsequently Puerto Rico; and

WHEREAS members of the international community, including Caribbean nations, have announced plans to celebrate the 500th anniversary of Columbus' voyages to the New World; and

WHEREAS a celebration of the anniversary of Columbus' historic arrival at St. Croix offers the Virgin Islands a unique opportunity to share this heritage with the peoples of the world and promote tourism; and

WHEREAS a celebration of this magnitude will require years of planning and preparation by the public and private sectors; Now Therefore:

BE IT ENACTED by the Legislature of the Virgin Islands:

SECTION 1. (a) The Government of the U.S. Virgin Islands recognizes the Christopher Columbus Jubilee Committee, Inc. (hereinafter, the "Committee") as the official Virgin Islands entity to coordinate celebration activities for the five hundredth anniversary of the Voyages of Exploration.

(b) Members of the Committee shall not be entitled to any compensation, but may be granted travel payments, per diem and reimbursement for actual expenses incurred in the furtherance of this celebration in accordance with the rules or by-laws of the Committee.

(c) The Committee shall:

(1) develop a comprehensive plan for the celebration of the anniversary;

(2) solicit contributions from public and private sources;

(3) develop a logo and other symbols designed to advertise the anniversary, in accordance with the rules established by the Christopher Columbus Quincentennial Jubilee Commission;

(4) communicate and exchange ideas with the similarly constituted anniversary committees in the United States, the Commonwealth of Puerto Rico, other Caribbean nations, the republics of Latin America, the Kingdom of Spain, the Republic of Italy, and others;

(5) investigate and report to the Legislature as to what steps must be taken by the Government of the Virgin Islands to sponsor commemorative medallions which can be sold to raise funds for the anniversary;

(6) sponsor (in conjunction with the University of the Virgin Islands, the public and private school systems in the Virgin Islands, the Virgin Islands Public Television System, and the local media) educational and academic programs and contests which focus on the historical and cultural issues associated with Columbus' exploration of the New World;

(7) develop (in conjunction with the tourism industry in the Virgin Islands and the Department of Commerce) a coordinated promotional package to advertise the Virgin Islands as a tourist destination; and

(8) report annually to the Governor and the Legislature as to:

- (a) the activities of the Committee;
- (b) the need for any further legislation necessary to enhance the workings of the Committee; and
- (c) all funds collected and disbursed by the Committee.

(d) The Committee shall maintain an account separate from all government accounts. All money appropriated to or collected by the Committee shall be deposited in the account. Disbursements may be made from the account in accordance with rules developed by the Committee.

(e) The membership of the Board of Directors of the Christopher Columbus Jubilee Committee, Inc. shall be equally distributed between the residents of the District of St. Croix and the residents of the District of St. Thomas-St. John; provided, however, at least one member shall be a resident of St. John.

SECTION 2. The Government of the Virgin Islands encourages a Congressional mandate for the United States Department of Interior National Park Service to establish, protect, develop and administer facilities for a Christopher Columbus Historic Landing Site (hereinafter, the "Site") on approximately 5 acres of land at Salt River, St. Croix, to include and encompass:

- (1) interpretation of the Site, with its prehistoric archaeological sites and adjacent areas;
- (2) recreation areas adjacent to the Site;
- (3) access to the Site by roads, self-guided trails and boardwalks; and
- (4) facilities such as an information pavilion, rest rooms, and parking lots.

SECTION 3. (a) There is appropriated from the Territorial Park Fund (Fund Number 506) to the General Fund of the Government of the Virgin Islands for the fiscal year ending September 30, 1987, the sum of \$10,000 to be made available as a grant to the Christopher Columbus Jubilee Committee, Inc., for promoting the celebration of the quincentennial of Christopher Columbus' exploration of the Americas.

(b) There is appropriated from the General Fund to the Christopher Columbus Jubilee Committee, Inc. for the fiscal year ending September 30, 1987, the sum of \$10,000 to be made available as a grant for promoting the celebration of the quincentennial of Christopher Columbus' exploration of the Americas, which amount shall remain available until expended.

SECTION 4. There is appropriated from the Territorial Park Fund (Fund Number 506) to the General Fund of the Government of the Virgin Islands for the fiscal year ending September 30, 1987, the sum of \$60,000 to be used as a grant to the United States Department of Interior National Park Service for the purpose of developing comprehensive plans for the establishment and management of the Christopher Columbus Historic Landing Site.

SECTION 5. (a) There is appropriated from the General Fund to the Department of Conservation and Cultural Affairs for the fiscal year ending September 30, 1987, the sum of \$60,000 to be used as a grant to the United States Department of Interior National Park Service for the purpose of developing comprehensive plans for the establishment and management of the Christopher Columbus Historic Landing Site, which amount shall remain available until expended.

APPENDIX M

SOILS

Soil information is described in the Soil Survey by the Soil Conservation Service (1970) as follows:

Aguilita gravelly clay loam is found in the mountainous regions in the middle of the Salt River area. There are two types of Aguilita soil present. Aguilita gravelly clay loam with slopes from 20 to 40 percent are found to the northeast, and Aguilita gravelly clay loam with slopes of 40 to 60 percent are found farther south.

The lower sloped soil has a very dark grayish-brown surface layer. The subsoil is a mixed very dark grayish-brown and dark grayish-brown firm, calcareous gravelly clay loam which is 50 to 70 percent limestone fragments. The soil can be used for woodland or pasture. The shallowness of the soil precludes cultivation.

The steeper slopes have a surface layer of 3 to 5 inches which is grayish brown to dark grayish brown. Gravelly clay loam reaches to a depth of 4 to 10 inches. The shallowness of the soil and steepness of the slope preclude most farm and nonfarm uses.

Cramer gravelly clay loam is found on the eastern side of Salt River Bay. Slopes in this area range from 5 to 12 percent. The surface layer of the soil is 8 to 10 inches thick and bedrock is found at a depth of 12 to 20 inches.

The area is suitable for pasture and woodland. The shallowness of the soil and its low water-holding capacity limit agricultural use.

Cramer stony clay loam is found at the headland to the east of Salt River Bay. From 50 to 70 percent of the surface of this Cramer soil is covered with stones and cobbles. The stones are 1 foot to 3 feet in diameter. The surface soil layer is 5 to 9 inches thick, and the depth to hard rock ranges from 10 to 20 inches. Very steep slopes, shallowness over rock, rapid runoff, and the low water-holding capacity severely limit this soil for cultivation of crops and make it difficult pasture land.

Descalabrado clay loam generally is found on the highest elevations of the westernmost portion of the study area, which consists of side slopes of dissected volcanic uplands. This involves areas with slopes of 20 to 60 percent. Most of the surface soil in this area is a dark grayish-brown clay loam, 3 to 5 inches thick. The subsoil consists of an upper part of brown, friable clay loam, and a lower part of dark brown, firm silty clay. The subsoil layers then are underlain by an olive-brown decomposed volcanic rock, which is very unusual in that the original rock structure still can be seen, but the texture is such that it can be penetrated easily by a spade. Between 10 and

18 inches below the surface, the greenish-gray volcanic rock is intact and hard.

Jacana clay loam occurs near the western mouth of the Salt River Bay. The area has slopes of 5 to 12 percent. This soil is found on the slopes and low rolling hills throughout the volcanic areas. The surface layer of the soil is 7 to 11 inches thick and the depth of partly weathered volcanic rock is 18 to 28 inches. The soil is suited for pasture and woodland use. However, its suitability for cultivated crops is limited by the shallow soils.

Jaucus sand comprises the soil along the shoreline within the bay and on the eastern mouth of the bay. This low, hummocky, sandy coastal area consists of excessively drained soils. The surface layer of grayish-brown calcareous sand is about 6-inches thick and contains many seashells. Light brownish-gray and pale-brown calcareous sand with many fragments of coral and seashells form the underlying layers. This sandy soil has a low water-holding capacity and low fertility.

Man-made land comprises much of the shoreline on the eastern side of the bay. In these areas sand has been dredged from the sea and used to fill the tidal flats and tidal mangrove swamps to an elevation above sea level and above the high tides. This type of soil is low in organic material.

San Anton clay loam is found just west of the existing Salt River Marina and within the Salt River Valley. Soils in this area have slopes of 0 to 3 percent. The soil is found on alluvial fans and narrow floodplains. It is a dark grayish-brown clay loam about 9 inches thick, underlain by a brown, friable gravelly clay loam. At a depth of 21 inches it is a brown, friable, calcareous gravelly clay loam which grades to yellowish brown, firm calcareous clay loam.

Tidal swamps occur along the edges of the bay. The vegetation in the area consists of a thick growth of mangrove trees. The soil in the area is light colored, saline and sandy or clayey. It contains a considerable amount of mucky or peaty organic material derived from the decaying mangrove trees. The underlying material consists of coral, shells, limestone, marl or clay. This land provides ideal habitat for birds and is a feeding and breeding area for oysters and crabs. It has no agricultural value. Flooding precludes its use for most engineering and recreational uses.